

CALCUTTA:
BISHOP'S COLLEGE PRESS.
M.DCCC.XLV.

JOURNAL
OF THE
Agricultural & Horticultural Society
OF
INDIA.

EDITED BY
THE COMMITTEE OF PAPERS.

VOL. IV.
PART I.—JANUARY TO DECEMBER, 1845.
ORIGINAL COMMUNICATIONS.

A body of men engaged in the same pursuit, form a joint stock of their information and experience, and thereby put every individual in possession of the sum total acquired by them all.—REV. DR. WILLIAM CAREY

CALCUTTA:
BISHOP'S COLLEGE PRESS.
M DCCCLXV.

Contents

OF PART I, VOL. IV.

No. 1.

	<i>Page.</i>
ART. I.—Memoir of the late William Griffith, Esq. F. L. S. Assistant Surgeon in the Honourable East India Company's Service on the Madras Establishment. By J. M'Clelland, Esq,	1
II.—Correspondence connected with the supposed discovery of a Teak Forest on the banks of the Koladine river, in Arracan,	40
III.—Report on the existence of Teak trees on the Banks of the Thaddé stream, in the vicinity of Sandoway, ...	49
IV.—Report on the Thoungyeen River, (Tenasserim Province,) and on the Teak Forest in its vicinity, ...	51
V.—A descriptive account of the tree which produces the Gutta Percha; by the Rev. Edward White. Communicated by F. J. Mouat, Esq., M.D.,	59

No. 2.

ART. I.—Observations on the applicability of Artificial Manures to the cultivation of the Sugar-cane, with some suggestions for the amelioration and extension of the Sugar cultivation in Bengal. By T. F. Henley, Esq., ...	61
II.—Correspondence regarding the experimental Cotton cultivation in Rungpore, with a few remarks on the staple products of that District,	92
III.—Extracts from Reports on Cotton and on the Experimental Cotton Farm at Gorruckpore,	105
IV.—On the Chinese methods of Tile and Brick-making, of burning shells for Lime, of expressing Oils, &c. Communicated by A. Grant, Esq. Bengal Medical Service, ...	110
V.—Communication from Mr. Southey, on the improvement of the breed of Sheep in India,	114

No. 3.

ART. I.—Observations on the quality, &c. of the principal Timber trees growing in the vicinity of Jeypore, in Upper Assam. By Capt. S. F. Hannay, (40th Regt. N. I.) Commandant of the Assam Light Infantry Battalion, ...	117
II.—Note on the Cotton of the Chittagong District. By A. Sconce, Esq., Bengal Civil Service, ...	135
III.—A few hints to Plant Collectors, by Mr. Robert Ross, Head Gardener, H. C. Botanic Garden, Calcutta, ...	138
IV.—On the mode of cultivating and preparing Cacao in the West Indies. By Mr. A. L. Harris, ...	140
V.—Further remarks on certain varieties of Sugar-cane. By J. V. Thompson, Esq. M.D., Deputy Inspector General of Hospitals at Sydney, ...	143
VI.—On a method of ascertaining the amount of Crystallizable Sugar in Khar or Muscovado. By J. W. Laidlay, Esq., ...	147
VII.—Further correspondence connected with the experimental Cotton cultivation in the District of Dacca, ...	151

No. 4.

ART. I.—Report on the Cultivation and Manufacture of Tea in Kumaon and Gurhwal. By William Jameson, Esq. Superintendent Botanical Gardens, North-Western Provinces, ...	173
II.—Botanical Observations in Upper Assam; being Part 6th of a Report on the Operations of the Assam Company in the Southern Division, to the month of February, 1843. By J. W. Masters, Esq., ...	197
III.—On the Fertilizing Properties of the Well-Water of Calcutta. By J. W. Laidlay, Esq., ...	235
IV.—Note on the Cultivation and Preparation of Madder. By a Member of the Society, ...	239
V.—Further correspondence connected with the Government Experimental Cotton Cultivation at Dacca. ...	241

I n d e x

TO PART I, VOL. IV.

	<i>Page.</i>
Botanical Observations in Upper Assam. By J. W. Masters, Esq. ...	197
Cotton cultivation (experimental) in Rungpore. Correspondence re-	
garding the,	92
—— Farm (experimental) at Gorruckpore. Report of the, ...	105
—— of the Chittagong District. Note on the, By A. Sconce, Esq. ...	135
—— Cultivation (experimental) in the Dacca District. Further	
Correspondence connected with the,	151, 241
‘acno. On the mode of cultivating and preparing in the West Indies.	
By Mr. A. L. Harris,	140
Gutta Percha trec. A descriptive account of the, By the Rev.	
E. White,	59
Griffith, William. Memoir of, By J. McClelland, Esq. ...	1
Manures (artificial) for cane culture. Observations on the applica-	
bility of, By T. F. Henley, Esq.	61
Madder culture and preparation. Note on,	239
Pl nt Collectors. A few hints to, By Mr. Robert Ross,	138
Sheep in India. On improving the breed of, By Mr. Southey, ...	114
Sugar-cane. Further remarks on certain varieties of, By Dr. J. V.	
Thompson,	143
Sugar (Crystallizable) in Khar or Muscovado. On a method of ascer-	
taining the amount of, By J. W. Laidlay, Esq.	147
Teak forest on the banks of the Koladyne River, in Arracan. Corres-	
pondence connected with the supposed discovery of a,	40
—— trees on the banks of the Thaddé Stream, in the vicinity of	
Sandoway. Report on the existence of,	49
—— forest in the vicinity of the Thoungyeen River (Tenasserim Pro-	
vince.) Report on the,	51
Timber trees in the vicinity of Jeypore, (Upper Assam.) Obser-	
vations on the quality of the, By Captain S. F. Hannay,	117
Tile and Brick-making, burning shells for Lime, expressing Oils, &c.	
Chinese methods of, Communicated by A. Grant, Esq.	110
Tea cultivation and manufacture in Kumaon and Gurhwal, Report on,	
By William Jameson, Esq.	173
Well-water of Calcutta. On the fertilizing properties of, By J. W.	
Laidlay, Esq.	- 235

INDEX TO NAMES OF CONTRIBUTORS.

TO PART I, VOL. IV.

	<i>Page.</i>
Bogle, Major A. Communication regarding the supposed discovery of a Teak forest on the banks of the Koladyne River, in Arracan, . .	40
Blount, Mr. S. M. Report regarding the experimental Cotton Farm at Gorruckpore,	105
Dunbar, J. Esq. Communication respecting the experimental cotton cultivation at Dacca,	151
Grant, A. Esq. On the Chinese methods of Tile and Brick-making, of burning shells for lime, of expressing Oils, &c.	110
Hopkinson, Lieutenant H. Communication regarding the supposed discovery of a Teak forest on the banks of the Koladyne River in Arracan,	46
Henley, T. F. Esq. Observations on the applicability of artificial manures to the cultivation of the Sugar-cane,	61
Hannay, Captain S. F. Observations on the quality, &c. of the principal timber trees growing in the vicinity of Jeypore, in Upper Assam,	117
Harris, Mr. A. L. On the mode of cultivating and preparing Cacao in the West Indies,	140
Jackson, W. B. Esq. Communication regarding the experimental Cotton Farm, at Gorruckpore,	105
Jameson, Wm. Esq. Report on the cultivation and manufacture of Tea in Kumaon and Gurhwal,	173
Laidlay, J. W. Esq. On a method of ascertaining the amount of crystallizable sugar in Khar or Muscovado,	147
On the fertilizing properties of the Well-water of Calcutta,	235
M'Clelland, John Esq. Memoir of the late William Griffith, Esq.	1
Maling, Mr. W. R. Report on the Teak forests on the Thoungyeen River, Tenasserim Province,	51
Masters, J. W. Esq. Botanical Observations in Upper Assam,	197
Phayre, Captain A. P. Communication regarding the existence of Teak in the Sandoway district, (Arracan,)	46, 49
Price, J. O. Reports regarding the experimental cotton cultivation at Dacca,	151, 241
Ross, Mr. Robert. A few hints to Plant Collectors,	138
Southey, Thos. Esq. Communication on the improvement of the breed of Sheep in India,	114
Sconce, A. Esq. Note on the cotton of the Chittagong District,	135
Thompson, Dr. J. V. Further remarks on certain varieties of Sugar-cane,	143
White, the Rev. Edward. A descriptive account of the tree which produces the Gutta Percha,	59

THE JOURNAL
OF THE
Agricultural & Horticultural Society
OF
INDIA.

*Memoir of the late WILLIAM GRIFFITH, Esq., F. L. S.
Assistant Surgeon in the Honourable East India Com-
pany's Service on the Madras Establishment. By J.
M'CLELLAND, Esq.*

[The Committee of Papers of the Agricultural and Horticultural Society of India—of which Mr. Griffith was, until so recently, a most able, experienced, and valuable member—cannot permit the following Memoir of their late esteemed and distinguished colleague to appear, without the expression on their part, of feelings of the deepest and most sincere regret at the loss which science has sustained. The Society has already recorded its opinion of Mr. Griffith in the following resolution, passed at the first General Meeting held after the receipt of the melancholy intelligence of his demise :—

“ That the Society is deeply sensibly of the loss it, as well as the science of Botany, has sustained in the death of William Griffith, Esq., one of the Society's most valuable members. It readily accepts the charge tendered by Mr. M'Clelland of the surplus numbers of the Journal of Natural History, and offers its best thanks to him for the Memoir of his late friend.”

Mr. Griffith was not only one of the most eminent, original, and indefatigable Botanists in India, but was always so ready, willing and anxious to advance the interests of the Society in every way, that

he was, perhaps, of all the members of that numerous body, the one whose services could least have been spared, and will be most missed. Notwithstanding the importance of, and incessant occupation afforded by his own more immediate pursuits, he was never once known to withhold his assistance when it was required, or to perform carelessly and in a grudging spirit the labour of examining the papers submitted for his opinion. Whether he be regarded then in the light of a scientific character of the highest order of merit,—as a most zealous, indefatigable member of the Society,—or as a private friend of frank, unassuming manners and address,—few will be inclined to dispute the heavy nature of the loss, which all have experienced, by his premature decease, in the midst of his useful, honorable, and distinguished career.]

He was the son of a merchant in London who died early in life, leaving a numerous family before he had time to provide affluently for it. His mother also died early in life, so that the children were well brought up by guardians. The family have been singularly unfortunate. Of four brothers who came out to India, three of them in the military service of the Hon'ble Company, Capt. Griffith, 11th Madras Native Infantry now only survives; and a nephew, the eldest of a numerous family, Lieut. Sanders, a fine, intelligent and promising young officer 18 years of age, was drowned on the river at Barrackpore only a few months ago, by the up-setting of a boat. Mr. William Griffith, the subject of our sketch, ever expressed the deepest gratitude to his guardians for the care bestowed by them on his family; and it was only a few months prior to his death, that he remitted to them the last instalment of the full amount they expended on his early education, in order that the limited means left for the benefit of his sisters might in no wise be diminished on his own account. These payments together with the expense of his pursuits kept him always without money, which he only regarded as the means of doing good, and may afford an idea of his generous character and liberal disposition.

He was born in March 1810, at Ham, and was educated at a good school near Pultney, from which several of his cotemporaries entered the civil and military service of India. After completing the ordinary course of education, he was apprenticed to a Surgeon residing in the west end of London, and soon after began to attend the classes at the London University, being one of the original pupils who entered about the opening of that School in 1829.

Zoology at first appears to have been his predominant taste, as I learn from a copy of Fleming's History of British Animals, which with some other books that had become useless to him, he left with me on his recent departure for Malacca, remarking, that it was well for Zoology he adopted Botany as his pursuit.

In the first of these books are numerous manuscript notes in his own hand, of which the following examples, apparently written when spending a Christmas vacation with his family, (who resided at a seat called Newlands near Harrow,) may remind most of us of the early associations of boyhood, while they exhibit at the same time an original simplicity of thought and observation, affording just promise of the future rank and distinction he attained.

Turdus viscivorus. The Missel Thrush. Common, associating with *T. pilaris* and *T. merula*, in stripping the hawthorn trees of the berries; I had not seen it before; voice very grating, somewhat like that of the jay, but much weaker.

December, 31, 1829.

T. pilaris. Fieldfare. Common, but until to-day not occurring in flocks, the berries of hawthorn a favourite food.

A beautiful and very elegant bird, the reddish-yellow about the throat and breast varying in quantity, and in brightness; legs varying from dusky to nearly black. Bill with nearly as little yellow as that of *T. viscivores*.

T. merula. Blackbird. Nest very different from that of the thrush, and by no means so neat. It is composed internally of fibres

while that of the thrush is plastered with clay, &c. December, 31, 1829.

Motacila alba. Wagtail. A solitary one seen at Newlands, 23d December, 1829, on a remarkably cold day.

Parus major? Titmouse. Common, frequenting the farm yard and trees in the Park. A restless bird, hardly ever remains a minute in one place.

P. cerulens. Blue Titmouse. Common in gardens, a beautiful but small bird, very active and very noisy, climbs trees readily and in every direction.

Pyrgita domestica. Sparrow. Common every where about houses, towns, &c. and universally reprobated as a desperate marauder. The male however is rather handsome, certainly a very neat bird, but the female is one of the plainest. In making their nests they shew a singular extravagance, not half the materials being wanted; the nests are made of every thing the bird can lay hold of.

Fringilla cælebs. Chaffinch. Almost as common, and quite as great thieves as the sparrows, but much more tame, and unsuspicious; almost all males, as I have only shot one female to day, (December 23, 1829.) The color of the males seems to vary much in the winter, as there is then much more red about the breast. The male is a handsome bird, the female far less so. They have the power of erecting the feathers of the head, thus forming a crest; their nests are beautiful specimens of what can be done by instinct. The bill is whitish, not blue, at least in winter.

Woodville and Stevenson's, and Churchill's works on Medical Botany—remarkable for the beauty of their illustrations,—were also studied by him about this period. In 1830 he obtained the Linnæan gold medal given by the Society of Apothecaries for high attainments in medical Botany, which he studied at the Apothecaries' Garden in Chelsea, under Mr. Anderson.

In such a school as the London University a mind like his could not remain long unsettled, without attaching itself to some branch of science on which he might stamp his superiority.

The higher branches of botanical science developed in the lectures of Professor Lindley, soon fixed his attention, and his future Christmas and other vacations were spent in botanical excursions, instead of remaining with his family at Newlands.

His reminiscences of these little excursions, auspicious of the more extended and enterprising travels in after life which distinguished his services in India, and contributed so largely to science, were dwelt upon by him with much interest, particularly as contrasting the poverty of an English, with the exuberance of an Indian Flora.

On these occasions he carried suspended to his shoulder his portable herbarium, sufficient to hold all the varieties of plants he could obtain in a week's excursion. But in A-~~ssam~~ or the Khasyah mountains, he could not on the contrary go out for a day, without returning not only laden himself with collections, but a train of followers also, whom he always enlisted into his service from the nearest village to his encampment. On his early botanical excursions in England he used like Linnæus and many other great men, to carry his wallet on his shoulder, containing the necessary changes of linen and of dress, the latter as little cumbersome as possible. On these occasions he always put up for the night at the nearest country inn. But in his travels in India he had frequently on the close of the day's labour to construct his own shelter for the night, or to pass it in the forest without any; as the writer of these remarks can testify, having had the honor to be his companion on one of his journeys.

Kew was a favourite haunt at the period referred to, but his interest with Mr. Aiton the head gardener, was not always sufficient for obtaining specimens of plants for observation. Such was the principle of exclusion on which such Gardens were then conducted, that on one occasion he was induced to conceal a plant in his hat, that had been present-

ed to him by one of the Foremen* not so much for the purpose of carrying it off successfully, as with the view of protecting the liberal benefactor who gave it him for examination, from the consequence of so great an offence. He used frequently to refer to this reminiscence with any thing but pleasure, and rejoiced heartily a few years ago when he perused Professor Lindley's report on Kew Gardens, in which it was proposed to throw them open to scientific men, as they now are, under the direction of an eminent botanist, Sir W. J. Hooker. A part of Professor Lindley's plan was to form a community of interest throughout all Botanical Gardens supported by the State, whether in England or the Colonies; and had Mr. Griffith been left a little longer in charge of the Botanic Garden of Calcutta, he would have contributed in effect to this proposal. At Kew, Mr. Griffith also made acquaintance with Mr. Bauer, the celebrated botanical artist and microscopic observer, a circumstance which probably contributed to his own excellence in these branches.

Early proofs of this excellence on the part of our late friend, are afforded by several of the illustrations in Professor Lindley's Introduction to Botany, which were introduced to that standard work, from the dissections and drawings of Mr. Griffith while yet a pupil.

He entered the medical service of the East India Company as an Assistant Surgeon on the Madras Establishment, 24th September 1832. The first place in which he was settled after arriving in India was Mergue, where he had medical charge of a detachment of Madras Troops.

His old taste for ornithology here returned, and in addition to his botanical recreations (or rather as he followed them, labours,) he also made a collection of birds. Happy

* Mr. Cunningham. This gentleman afterwards raised himself by his botanical acquirements to a distinguished place, and fell an early victim to botanical zeal in New Holland.

perhaps for himself, and for science too, had he been allowed to follow his occupations undisturbed in the rich provinces of Tenasserim. The sincere friendships which he there formed with the authorities, and the exhaustless resources, and variety of occupations open to him in such a field, would have afforded ample scope for future eminence.

He was invited in 1835, to repair with all haste to Calcutta with a view of proceeding on a deputation to Assam, for which his services were supposed to be essential. From this period although a Madras Officer, he continued to serve under the Supreme Government of India in the Chief Presidency, Bengal.

After the performance of that service, and the return of the gentlemen to Calcutta with whom he was associated on deputation, he was retained in Assam at the recommendation of Capt. Jenkins, the Commissioner, for special service.

The disturbed state of the frontier, and the little that was known of the countries and tribes beyond it, induced the Commissioner to send him into the Mishmee mountains, only before visited by one European, and, who had occasion to make a precipitate retreat from the supposed treachery of the inhabitants. Mr. Griffith entered these mountains accompanied only by a single servant carrying a stock of provisions, and after remaining about six weeks, travelling alone unmolested over elevations of 8,000 feet and upwards, descended again into Assam visiting Bramakund, the highest known point of the great south-east branch of the Burrampooter, on his way back, bringing away extensive collections of plants, &c. and at the same time leaving a favourable impression behind him of the British character, which could not fail to have a beneficial effect on tribes with whom it was so little known.

It became necessary about this time to ascertain something of the political influence of the Burmese on the frontier, and

to learn exactly how far the frequent interruptions of the peace of Upper Assam might be owing to such cause, as well as to collect as much local information as possible of the nature of the country between Burma and Assam.

With this view it was thought expedient that a conference should be held between the Burmese and British authorities on the frontier. Mr. Griffith joined the Political Agent of Upper Assam, and having reached the appointed place where they were to meet the Burmese authorities, and finding they had not arrived, the party after waiting a reasonable time returned to Assam.

Another arrangement was soon after entered into with the same view; an officer was sent round to Calcutta from Ava, whose knowledge of the Burmese character it was supposed would contribute to the success of the proposed object on our side, while another British officer, the late Dr. Bayfield, was to accompany the Burmese Commissioner.

Major White, the Political Agent in Upper Assam, and we believe Capt. Bigge, together with the officer who was sent round from Ava for the purpose, set out on a second attempt to meet the Burmese authorities, accompanied by Mr. Griffith. But unable to proceed beyond the frontier, in consequence of the reported difficulties and the unknown character of the country, the party returned to Assam, with the exception of Mr. Griffith.

He proceeded onward, accompanied only by a servant, having taken leave of the Assam authorities sometime in the month of February. (I forget the exact date.) Several months passed, and no account was heard of him. Vague reports of his assassination reached the public prints; the Government it was said having received full particulars. The revolution that broke out in Burma in the mean time, tended to confirm this, and his fate was considered hopeless. Some months after, when all hopes of him were abandoned, he reappeared in Calcutta about the middle of June entering

my room without any previous notice, as if he had merely returned from a shooting excursion. He had just, in fact, arrived in a little schooner from Rangoon (in which by the way he was nearly lost at sea.) Without sitting down, I drove him at once to Government House, where I shall never forget the joy with which he was received by Mr. Colvin, the private secretary. It was only the day before when further concealment was thought unnecessary, that all particulars of his supposed assassination appeared in the daily papers as received from the political authorities in Upper Assam, two months before. After delivering the despatches of which he was the bearer from Col. Burney, the first that had been received from the British Residency at Ava for two months, he expressed a wish to withdraw, as the private secretary broke the seals. Mr. Colvin replied, that Lord Auckland would be most anxious to see him; he then referred to his dress as an excuse for being allowed to retire. But all rags as he certainly was, he was ushered into the presence of the Governor-General. On this enterprising journey which would have established the character of any man who had no other claim to distinction, he was exposed to many dangers, which proved his intrepidity of mind, as well as prudence of character.

It was sought on one occasion to deprive him of a boat, and thus interrupt his progress down the Irrawaddi towards Ava. Firmness was necessary, and matters went so far that guns were levelled both at him and his companion, Dr. Bayfield, who had been deputed from Ava to meet him.* At Ava he remained but a few days, when he was sent forward to Calcutta by the Resident, with despatches. Burma being still in a state of revolution, he descended the Irrawaddi in a canoe, to find his way to Calcutta as he

* No one was ever more reserved in matters redounding to his own credit. I heard of this adventure from his friend Capt. M'Leod, who was afterwards Resident at Ava, and to whom the circumstance was no doubt officially known.

best could under the difficult circumstances of the country. The canoe was so top-heavy with bulky collections of plants, that he afterwards said he ran equal risk of being upset, particularly in some of the more rapid parts of the river where swimming would be of little use, as he did of being shot, either as a spy, or, for the inducement to plunder which the size of his collections held out. Providence ordained that his valuable life should be a few years longer spared, to achieve further service to his country, and the cause of science.

He thus accomplished not only whatever political object was expected from the Mission, but brought away with him in addition, extensive Botanical and Ornithological collections, and other information from regions never visited before, at least by any one capable of affording so good an account of them as himself.

His report of the results of this journey, no doubt an important document, has not been given to the public, although it contains scientific information, as we know every thing he wrote does. A severe fever seized him soon after his arrival in Calcutta, partly brought on by the exposure he underwent, and partly by over-application to his collections and report, which his eagerness to enter on some new enterprise, made him anxious to despatch as quickly as possible.

He was next directed to prepare for returning to Upper Assam, where his services had now become so distinguished. It was intimated to him that he should revisit the Mishmee Mountains, with a view to establish a friendly commercial intercourse with the natives, with whom his unassuming manner, no less than the unpretending nature of his pursuits, had given him much influence.

When on the eve of returning to Assam with these orders, and after having furnished himself with 1000 Rs. worth of presents suited to the taste of the people he was about to revisit, his destination was changed, and the presents were

thus thrown upon his hands without any the slightest application for compensation on his part. I know his affairs to have suffered heavily by such delicacy, which however mistaken, formed nevertheless a generous ingredient in his public character. He was now appointed Surgeon to the Embassy about to be deputed to Bootan, under charge of Capt. Pemberton.

Instead of availing himself of the prolonged stay which this change would have enabled him to make at the presidency, he proceeded in advance of Capt. Pemberton on the 31st of July, about six weeks after his return from Burma. In that short period, notwithstanding a severe fever, he arranged and despatched to the Court of Directors extensive collections of plants, and furnished the Government with a full report of his late adventurous journey. His object in thus hastening his departure was in order that he might have an opportunity of revisiting the Khasyah mountains, the flora of which he had only cursorily examined before, at a wrong season. After accomplishing this object, while the embassy proceeded by the more tedious route up the Burrampooter, he crossed into Assam, and joined Capt. Pemberton at Goalpara.

The mission entered Bootan north of Gowahatti, and after penetrating about 80 miles into the mountains in that direction, it diverged to the westward, and returned to Bengal by the Buxa Doar, having traversed above 400 miles through the heart of Bootan. Mr. Griffith returned to Calcutta from this duty about the end of June 1839, and employed the next three months in the arrangement and despatch of his collections to the India House, an anxious and laborious duty which he had always after the close of a journey to perform, over and above the ordinary reports which officers employed on special service have usually to make. His reports were also from their nature, difficult and laborious. Yet such was his ardour in the pursuit of knowledge,

and zeal in the service of the Government that, in November following he joined the army of the Indus, collecting objects of Natural History along the whole line of march, and availing himself of excursions northward to the confines of Toorkisthan. His collections of plants and animals of every description made on this occasion, as well as his route surveys, barometrical observations of heights, and accurate measurements of latitudes and longitudes, extended from the Indus to the banks of the Helmund and the Oxus.

He messed when at Head Quarters with the Engineers, who each and all became sincerely attached to him. Of the friends he formed on the occasion, I may mention the late lamented Col. Sanders, and Lieut. Sturt; with the latter he resided when at Cabool.

In addition to the ordinary risks of such a campaign,* his pursuits frequently led him into danger. On one occasion returning about nightfall into camp, laden with plants he had collected during the day, he found himself intercepted by a party of Affghans who opened fire on him, one of their shots wounding a servant by his side. He was always armed, and providentially so on the present occasion. He returned the fire, which was kept up on both sides, and thus protected his defenceless party against large odds for sometime, until extricated by sepoys, who hearing shots came to his assistance. A bad fever he contracted in Affghanistan obliged him to quit that country, which he did in safety about the beginning of 1841.

He then visited Simla and the Nerbudda, and returned to Calcutta in August, where he again arranged and despatched large collections to the India House, the result of his travels beyond the Indus. He was now appointed Civil Assist. Surgeon at Malacca.

* In all these he bore his part, even in the storming of Ghuznee for which he received a medal; and perhaps no officer in Affghanistan of his rank, suffered more severely than he did in the loss of camels and property.

With this he was satisfied, from the supposed facilities it would afford of extending his botanical and other knowledge, —all he ever thought of.

His friends however, considered him entitled to something better, but they knew it to be only a temporary arrangement until an opportunity offered for more suitable employment.

Unfortunately for himself, his opinions regarding the state of Affghanisthan, did not coincide with those of the higher political authorities. But he had good opportunities of judging for himself. He was vested with no authority, and his pursuits led him away from armed protection, and enabled him to see the real spirit of the people exhibited without restraint. Besides, it must be allowed that he had acquired great experience during the course of his former services, which no less than the known candour and honesty of his character, ought to have entitled even his political opinions to respect.

Nevertheless, the freedom with which he expressed sentiments in his Affghan report, at variance with those of persons in authority, is said to have been unfavourable to him; and on this account he was not considered entitled to that remuneration for his services in Affghanisthan, which he had been in the receipt of for several years before.*

Having addressed a memorial to the Honorable the Court of Directors, which was favourably supported by the Government of India, his claims were authorised; but he neglected to ask for interest and expense of life insurance which he had to pay to his agents, so that his arrears when he received them, were little more than sufficient to relieve him from the expenses in which his pursuits had involved him. He was however assured by Mr. Bird, then at the head of the,

* The objectionable document was returned to him, and another report required in which political matters should be omitted. This was complied with. In the mean time the assassination of Sir A. Burnes took place, and proved that he had but too much ground for having given in his first report, prominent place to his opinions of the unsettled state of Affghanisthan.

Government of Bengal, that the terms in which the Honorable Court complied with his memorial, were of the most flattering description. Mr. Bird added, that as long as he had himself been in the service, he never knew an officer addressed in more complimentary terms than those of the Honorable Court, in granting the prayer of his memorial.

During the period of his travels in one part of the country, it was customary for him to have collectors employed in another. He usually attached to his person some intelligent native of the place in which he travelled.

The attachment of mountaineers to their home is proverbial, and on that account he never allowed them to accompany him beyond their native hills; but his connection with such faithful followers as he found amongst them did not end here. He generally retained their service afterwards as local agents or collectors of plants, &c. remitting to them the same regular salaries they received while he was amongst them, and they in return transmitting to him the results of their labour in the shape of collections. This connection, so creditable to the good faith and attachment of parties so differently circumstanced, in some cases lasted for many years, in others it is only now severed by his death.

Touching incidents of character might here be adduced, exhibiting the rude attachment of poor indigent natives of distant hill provinces to his person and his service. Occasionally they have even overcome their natural attachment to home so far as to visit him in Calcutta, where their dress, independence, and blunt affable manner, formed a striking contrast with the natives of Bengal. Previous to his departure for Malacca he made arrangements for the permanent employment of a native of the Khasyah hills, (Jumka, who had been retained there by himself as a collector since 1837,) by which his salary will in future be secured to him from the Botanic Garden. He also on the same occasion settled a pension of 2 Rupees a month, payable by his agents to the

family of a poor man killed accidentally by the fall of a tree in the Botanic Gardens.* At Malacca he had two faithful collectors who, he continued up to the period of his death to support out of his private means, and it is gratifying to be able to state that they are in future to be continued as collectors on the establishment of the Botanic Garden. I need hardly advert to his works, because incompetent to afford more than a list; an analysis of them may be left to, and will doubtless be performed by abler hands at home, when the melancholy news of his premature death becomes known. They are as follows:—

1. On the Family of Rhizophorææ. Trans. Med. and Phys. Soc. Calcutta, 1836, vol. viii.
2. Description of two genera of the Family of Hamamelidææ, two species of Podestemon, and one species of Kaulfussia. Asiatic Researches, vol. xix. 1836.
3. Journal of a Mission to Bootan, 1837-38, communicated from the office of the Pol. Secy. to Govt of India. Journal Asiatic Society, vol. viii. 208, 241.
4. Muscologia Itineris Assamici; or Description of Mosses collected during the journey of the Assam Deputation in the years 1835 and 1836. Proceedings of the Linnæan Socceity 1838, Calcutta Journal of Natural History, vol. ii. p. 465, vol. iii p. 56, p. 270.
5. Remarks on a collection of plants made at Sudyah, in Upper Assam, from April to September 1836. Journal of the Asiatic Society, vol. v. p. 806.
6. Some remarks on the development of Pollen. Journal Asiatic Society, vol. v. p. 732.
7. Description of Grasses which form part of the vegetation of the Jeels of the Sylhet Districts. Journal of the Asiatic Society, vol. v. p. 570.

* Having left no funds, I regret to state that the Agents on the announcement of his death, have discontinued this pension, which accounts for my becoming acquainted with the circumstance.

8. Journal of a visit to the Mishmee hills in Assam. Journal Asiatic Society, vol. vi. p. 325.
9. On the structure of ovula in two species of *Ephedra*. Ditto, in some Orchideous plants. Ditto, in *Callipeltis*, and *Galina*. Proc. Linnæan Society, 19 January 1841, No. xi p. 90.
10. Ditto on *Santalum* and *Osyris*, o. c. No. xiv. p. 121. Ditto, in *Isoetes capsularis*, Roxb. showing the sporules or seeds to be produced from the division of a simple cell, or its contents, and that several sexual distinctions do not exist, as received by botanists, either in *Isoetes* or *Azolla*. l. c.
11. Report on the Tea Plant of Upper Assam. Transactions of the Agri-Horticultural Society of India, vol. v. Calcutta, 1838.
12. Extracts from a report on subjects connected with Affganistan, communicated from the office of the Political Secretary to the Govt. of India. Journal Asiatic Society, vol. x. p. 797.
13. On some plants, mostly undescribed, in the H. C. Botanic Gardens, Calcutta. Cal. Journal Nat. Hist. vol. iv. p. 375.
14. Palms of British India. Cal. Journal Nat. Hist. vol. v. p. 1, 211, 245.
15. On *Azolla* and *Salvinia*. Cal. Journal Nat. Hist. vol. v. p. 229.
16. On some plants in the H. C. Botanic Gardens. Cal. Journal Nat. Hist. vol. v. p. 355.
17. On the development of the ovulum of *Santalum* and *Loranthus*. Transactions of the Linnæan Society, vol. xviii.
18. On the ovulum of *Santalum*, *Osyris*, *Loranthus*, and *Viscum*. Transactions of the Linnæan Society. vol. xix.
19. Some account of the Botanical collection brought by

Dr. Cantor, from the Eastward. Asiatic Researches, vol. xxi.

20. On the Black-dye plant of the Shans, and on the Gutta Percha, or Gutta Tuban. Journal of the Agri-Horticultural Society of India, vol. iii. p. 143.
21. An attempt to analyse Rhizanthæ, &c. Proceedings Linnæan Society, 1844.
22. On a few plants from Central India. Cal. Journal of Nat. Hist. vol. iii. p. 361

The works which he edited are——

23. *Hortus Suburbanus Calcuttensis*, a very important work by his late friend, Mr. J. Voigt, now in course of publication.
24. The Botanical Writings of the late Mr. Jack.
25. The Criptogamous Plants of the late Dr. Roxburgh, both in the Calcutta Journal of Natural History. vols. iv. and v.

The third and eighth paper in the foregoing list, relate as much to the people and statistics of Bootan, and the Mishmee Mountains, as to the Natural History of those little known regions. The same may be said of No. 12, which likewise contains much geographical information.

No. 4, and No. 14 are both elaborate papers; the one devoted to a description of the various kinds of Mosses, the other to the species of Palms belonging to India.

Prior to his researches, nothing whatever had been done towards a description of these two extensive sections of our Indian Flora, a dominion which he has thus appropriated to himself, and which will be awarded to him by contemporary and succeeding botanists.

Nos. 2, 5, 7, 13, 16, and 22, relate to his collections of plants, and to the description of some that were unknown before; but the general list of his collections, and of all the new forms which science owes to his zeal, have not yet been published.

Nos. 1, 6, 9, 10, 15, 17, 18, are for the most part elaborate papers relating to the highest and most philosophical questions in botany, for which the exuberance of vegetable growth and development, afford facilities of observation in India, never before taken advantage of to the same extent by any of his predecessors or contemporaries. It will be for his friends in Europe to do justice to this portion of his labours.

Nos. 11, and 20, relate to economical subjects of great importance, namely the Tea plant of Assam, the plant producing Black-dye in the Tenasserim provinces, and the Gutta Percha. To appreciate the value of the first of these papers, it is necessary to remember, that all authorities up to the time at which it was published, regarded the Tea as a mountain plant, and to cultivate it successfully it was supposed to be necessary to remove it from Assam into the Himalaya. His report, on the contrary, proves as far as the means of exact comparison extends, a satisfactory correspondence between the flora of Assam and that of the Tea districts of China. This, together with the fact of the embassies of Lords Macarney and Amherst, meeting with the Tea plants in China only when in boats on the great rivers, sufficiently established the identity of circumstances between Assam and the best Tea provinces of China. To him was due the successful formation of the Assam Company; for it is not to be supposed that the public would have subscribed to the cultivation of Tea in Assam, so long as the highest botanical authorities conceived the plant to be out of place in that province.

There were some points of resemblance between him and the late William Jack, with whose fate he displayed a deep sympathy, testified by the erection of an elegant monument in the Botanic Garden to his memory, which had been sanctioned twenty years ago, but only carried into effect during his brief superintendence.

Mr. Jack at a very early age attained great distinction, no less by his zeal than the depth and accuracy of his botanical observations. Mr. Griffith always regarded him as a Botanist of the very highest order, and frequently referred to his descriptions as autographs of his plants. Mr. Jack's descriptions are generally well executed elucidations of species, and limited groups. Mr. Griffith's unsettled occupations were unfavourable for this, as he was constantly drawn into new fields, and detached from libraries and means of working up parts in detail. Such facilities Mr. Jack happily in some degree possessed, as Surgeon to Sir Stamford Raffles. Mr. Griffith looked to a quiet residence at Malacca for doing much, and to an early retirement for doing all that he hoped to accomplish with his extensive materials.

Mr. Jack's views of botanical classification were regarded by Mr. Griffith as in advance of his age ; his own views we know to be so, as regards general classification ; and whoever attempts from his materials to do justice to him in this respect, should not be much behind him.

He had this advantage of most men who devote their chief attention to one pursuit. He was well acquainted with the condition of the other sciences, and generally well read in ancient and modern history and literature. He seldom travelled without his favourite authors on these subjects, to whom he referred with great enjoyment when fatigued by his botanical studies. He latterly took a great interest in Church history and theological writings, from his friendship with the Professors at Bishop's College, whose Library he had access to, during his residence at the Botanic Garden. Astronomy afforded him deep interest, and on his return to the Straits, he took a large and beautiful five feet achromatic telescope with him, in order to improve his recreations in this sublime department of knowledge. He never travelled without his sextant and surveying instruments when he could procure them, and no one knew better how to make use of

them. This will confer an additional interest on his collections, since the exact position and altitude at which each plant was found, are accurately noted in his papers.

With the higher principles of Zoology, and the works of philosophical writers on that subject, he was well acquainted. One of the reforms he was anxious to introduce, was the uniformity of nomenclature, which he thought should be the same at least in Botany and Zoology. In this he set the example himself; but he aimed at still higher reforms in philosophical botany, suggested by the zoological works of Swainson and Macleay with which he was perfectly familiar. The doctrine of types, and circular affinities, occupied his attention long; and I know him to have been reconciled to a general distribution of the vegetable kingdom, on principles corresponding with those laid down by the zoologists above mentioned. He often regretted that botanists neglected to avail themselves of such sources of information as zoological works afford, particularly as he was deeply impressed with the force and importance of the many striking analogies that exist between the vegetable and animal kingdoms.

His extensive experience both in structural botany and the habits and distribution of plants, at his years, rendered him one of the most likely persons to accomplish some great step in the improvement of botanical, and general science. But it is enough on this occasion merely to adduce local incidents connected with his service in India.

He availed himself during his residence at Malacca, of every opportunity of extending his botanical knowledge of that Peninsula, and adjoining islands.

He visited Mount Ophir in company with Sir W. Norris, and was much delighted with the scenery, particularly with the change of vegetation observed in ascending the mountain.

In January last, on his return again to the Straits, only a month before his death, he visited Penang for the first time;

and in a letter dated 15th January, he observes that the change of vegetation is not so remarkable on the hill at Penang, as it is on Mount Ophir. "I got two new Rottangs," he observes, "and left a third behind." In the same letter, written six days after his arrival at Malacca, he says, "I have not yet set about anything; one of my botanical places is destroyed, so that I shan't get much, unless I go four or five miles. Moorhead (the medical officer, his predecessor, of whom he writes in high terms) leaves immediately, so that I shall be here alone; *n'importe*, I have more work at home than abroad."

"I hope soon," he continues "to set about the last part of the Palms; I see two other new ones among those brought by my collector! I hope to do a great deal here, the place has so many facilities for study." In a still more recent letter, dated 28th January, he continued to write in the same happy strain, without referring to any complaint, but Mrs. Griffith, writing at the same says, "that he had been complaining, but is now quite well again."

His next letter, dated 5th February, written on his death-bed, ran thus:—

"I write this by deputy, being seriously ill of Hepatitis; the attack has been very severe, and the treatment necessarily active, so that I am reduced to an extreme state of weakness; although my adviser does not despair still the issue is doubtful, and under this impression I commence a few lines to you on business. Mrs. Griffith (supposing the result of this illness to be fatal to me) will bring up with her all the collections at Malacca, and they being added to those at the Export Warehouse, and all having been previously cleaned and packed, I leave to you, to present to government for the Hon'ble Court of Directors, to be sent home without any delay.

"As you know the trouble I have taken with these collections, and the hopes I had of making them subservient to

a general scientific Flora of India, I need not press on you, how much I am interested in their proper disposal, and their being brought properly before the scientific public ; and I would say the same regarding my drawings and manuscripts, which will also accompany my wife, should it so happen that I leave her."

After expressing with extraordinary tranquillity and depth of feeling, his wishes and cares regarding his amiable and accomplished lady, (to whom he was united only four months,) so soon to be cast into premature widowhood,* he next refers with the same exquisite sensibility to his sisters in England, whose loss is almost equally great. He then resumes the subject of his collections as if to guard as much as possible against any inconvenience his death might occasion to the public interest ; and continues in his dying moments.—“ Among the plants now with me at Malacca, the bundles of which are marked outside, ‘ Himalaya ’ and ‘ Lower Bengal, ’ there are very many which may be thrown away with great advantage, and for this reason,” he adds with his usual humility and moderation, “ Government would probably allow two or three mallies to be employed as before, in the Export Warehouse, for their proper preservation, &c.”

And thus concludes, “ In all the plans I have entrusted to your execution, I am confident your own feelings will prompt you to every exertion on my account. Asking God’s blessing on you, and your wife, I bid you good bye.”

“ Thus far,” continues Dr. Moorhead, five days afterwards on the 10th February 1845, “ was written at Dr. Griffith’s dictation, but I grieve to say the fatal result which was dreaded came to pass yesterday evening, Sunday the 9th February, at half-past seven o’clock.” His only regret being,

Mr. Griffith, was united on the 21st September, 1844, to Miss Henderson, a connexion of his own, her sister having been married to his brother, Captain Griffith.

that his papers were not left in such order as he could have wished.

Thus he died as he lived, a devoted servant to the Government and the public interest, for which his last aspirations were offered up in sincere Christian piety. Perhaps there is no man of his day, whose loss will be more felt. Had he been spared a few years, he would assuredly have contributed largely to the advancement of human knowledge. For this object alone he laboured from his boyhood, and brought a degree of energy and of enterprise to his aid, which enabled him at the early age of 34 years to attain materials for a general Flora of India, collected by his own hand, and under his own personal observation, in almost every province of the empire, from the Straits to central Asia.

His experience certainly embraced every province in India presenting any peculiarity of vegetation, or of agriculture, and although he has left extensive collections and manuscripts, yet it is melancholy to contemplate the amount of important information, that has descended with him to an early tomb; information acquired under so many perils, with an aptitude and an energy, such as we cannot hope to see combined in one individual again. It was probably in this point of view no less than his power as a teacher that Sir H. Hardinge, in sentiments dictated by the best feelings of human nature when addressing the pupils of the Medical College on a recent occasion, referred to the death of Mr. Griffith as a public calamity.

To an accidental detention at Malacca, of his predecessor the officiating Medical officer, is due the requisite medical treatment which he received in his fatal illness. Dr. Wm. Moorhead writes,* that he complained on 31st January of

* You may be interested in learning from me, his friend and medical adviser, some account of the disease which has taken away from us so valuable a friend, and from our profession so bright an ornament.

an acute pain in the right side, which came on suddenly after an evening drive, for which he was immediately bled; this afforded some relief, but the following day the pain returned; he was again bled; which, together with the ordinary remedies, afforded but temporary relief. On the fourth day, an enlargement of the right side appeared; on the fifth, hectic fever came on, and the case was pronounced

Up to about 10 days ago, he appeared perfectly well and to enjoy good health; on the 31st January, in the evening, he came to my house and asked my advice as he had been troubled during the afternoon with severe pain in the region of the liver, oppressed breathing, &c. I recommended free bleeding from the arm, leeching, purging &c. which was done, and afforded relief; but on the next morning, the symptoms though in a degree abated were still present. The local and general bleeding was again ordered, and had decided effect in subduing pain, relieving oppression of breathing, and reduced the pulse and temperature of the skin. Calomel with digitalis and tartaremetic, was given every three hours, and when leeching was no longer practicable, a large blister laid over the region of the liver. Still, though the pain in the region of the liver was very slight, the pulse continued quick, the skin became again hot, countenance heavy, and altogether there were sufficient grounds for anxiety as to the issue. The speedy action of the mercury on the constitution was now the only resource left, and it was accordingly administered every two hours, and without other medicine. To my great grief and disappointment, 4 days passed without any of the wished for signs appearing, and on the 5th day I relinquished its use, being convinced from previous experience, that further perseverance would only be prejudicial. Hectic symptoms now presented themselves, soon followed by cold clammy sweats, and other indelible signs of the worst having happened. He retained his senses until about five hours before his death, and as you will learn made all his arrangements clearly for the disposal of his affairs, his collections, &c. These are of course for the present in the hands of the Commanding Officer and a Military Committee. His poor widow (who is as well as can be expected,) is now staying at the Resident's, Mr. Lushington, she will take the earliest opportunity of proceeding to Calcutta, and I heard her husband give her instructions, should her funds fall short of the amount of passage money, she was to draw a bill on you to make up the deficiency.

I should let you know what the Autopsy disclosed;—all the marks of recent acute inflammation of the liver; all the dorsal portion of the right lobe softened, and in the midst of this a small abscess containing about an oz. of apparently freshly formed pus; but it was in the colon that I found the most extensive organic changes, and for which nothing that I had seen in this illness, or ever heard from my poor friend, had prepared me; throughout its whole length it was thickly studded with ulcers mostly about the size of a 6d. piece, and evidently of long standing; the cæcum was very much disorganized, its coats had become nearly $\frac{1}{2}$ an inch thick, the mucous coat one sheet of ulceration; pus infiltrated between the different coats, and the external firmly adhering to the peritonæum on the parietes of the abdomen.

I write this only a few hours after the occurrence of the melancholy event, and consequently in much confusion; but I have reason to know what interest you will feel in every thing connected with the loss of so valuable a life. I beg to assure you that I am yours respectfully,

W. MOORHEAD.

Asst. Surgeon, Madras Army.

February 10th, 1845.

hopeless. He himself had little hope of recovery from the beginning. He retained all his faculties to within a few hours of his death, on the 9th February. He displayed on that melancholy occasion, as he did throughout life, great fortitude and resignation, disposing as above detailed of all his collections, and MSS. according to what he conceived to be, the interest of science.

In person he was of middle size, and strong compact frame. His countenance was prepossessing, and bore the stamp of intellect, which was confirmed by a decided manner, and unassuming address.

When I first met him about ten years ago, his appearance was very youthful, and his spirit unclouded and excessively cheerful. But the privations and cares to which he was incessantly exposed for seven years afterwards, told upon his looks, which became prematurely aged.

The expense and encumbrance of collections, and anxiety for their safety in his unsettled state, were very painful to him. On coming to Calcutta, he left large collections behind at Malacca to save the expense of freight in bringing them with him, under the chance of returning again to the Straits. On his recent return from Calcutta to the Straits, he also left large collections behind him, for the same reason. So also during his different journies, large collections of plants were always left at expense in Calcutta. With these it was necessary to leave an establishment for their proper care, as the parcels required to be kept open, in order to preserve their contents from damp and insects. All this, as may be supposed, was a source of deep anxiety to him, as much care was requisite not to injure the specimens, or displace the labels. I mention this particularly in order to show what a heavy tax upon his time and means his collections were. To them he looked as the means by which he should have to discharge all his higher duties, and render the results of his travels permanently useful.

Writing from Culpee 15th Dec. 1844, on board the "Victoria," three days after his recent departure from Calcutta, he observes, "The only things I am now anxious about, are the collections at the Export Warehouse; I should much wish to have some check on Roopchaund who is left in charge. Perhaps Mr. Grant could manage to have him report himself every day coming and going, to one of the subordinates; and if you could drop in occasionally and note what is doing, I could soon see whether it is worth while risking their being damaged by leaving them behind." The collection in question consists of a series without duplicates of all the plants he collected, amounting to no less than seven or eight thousand species, each carefully labelled. Their value to him was incalculable, and the pain at being still unsettled, and compelled from the limited emoluments of his situation to leave them behind, was very intense.

His extensive scientific correspondence and numerous dawk bangy and other parcels of seeds, plants and books from all parts of India and from Europe, also entailed expense, which the small pay of an Assistant Surgeon to which he was reduced at Malacca, could ill afford him to meet, in addition to the other expenses of his collections and pursuits. In December and January last, two months when his parcels and letters came to my house, their freight and postage amounted to 150 or 200 Rs., a tax upon the eminence he attained, from which there was no way of escaping.

I mention this, in hopes that his distinguished merits as a public servant, may commend his widow and family to the clemency and consideration of the Government of India, to whose service he was so bright an ornament, and to that of the Honorable the Court of Directors, to whom he has bequeathed all his collections of Natural History as well as manuscripts and drawings.

An application from the distinguished persons in Europe to whom he was known, might promote this object. Pro-

fessor Von Martius of Munich, and Professor Lindley, Sir W. Jackson Hooker, Mr. Brown, Mr. R. H. Solly and Dr. Horsfield, are those with whom he corresponded on terms of affectionate cordiality.

The candour and simplicity with which he always expressed his real opinion in matters which he conceived in any way affecting the interest of society or of science, at one time involved him in differences quite foreign to his nature. But his artless disposition, and sincerity of heart and speech, were amongst the greatest charms of his character. He was himself scrupulous even perhaps to a fault, in matters connected with the public interests, and he seemed to expect the same from all those with whom he was connected in the discharge of his duty. To this cause was due many observations in his writings which might otherwise be attributed to personal motives, from which no man was more exempt. There never was a man whose life and service exhibited more of a generous devotion to the public interests altogether incompatible with selfish objects, nor was ever any one more capable of appreciating, or ready to acknowledge a generous action on the part of others.

To the sufferings and wants of his fellow creatures he was also keenly alive, and ever ready to contribute to their relief. To the Catholic orphan children (perhaps the greatest objects of charity to be met with, from the indigence of the class to which they belong,) he regularly contributed a small sum monthly, and no object of distress was brought to his notice during his residence in Calcutta, that he did not privately contribute to relieve.

His private virtues may be summed up in a few words—he was an affectionate husband, and brother; an ever faithful and sincere friend; and eminently consistent and exact in all his engagements.

In his diet he was remarkably sparing, and for some years prior to his death, he abstained from wines, which the observ-

ed unfitted him for study; and his personal expenses for mere living as regarded himself were very trifling.

He had no fixed distribution of time; he retired early to rest and rose early. He always, when time permitted, availed himself of a morning walk at daybreak for an hour, the rest of the morning he devoted to business, answering letters received the day before, in which he was generally very exact. The rest of the day, unless interrupted, was devoted to the examination and dissection of plants under the microscope, drawing and describing all peculiarities presented.

The evenings were devoted to general reading, which he also had recourse to when indisposed to work. But he was never idle; and during the ten years I have known him, his industry and occupations continued unchanged. Even on his death bed, his microscope stood beside him with the unfinished drawings and papers and dissections of plants on which he was engaged the day on which the fatal symptoms of his disorder came on. Such were the constancy of his efforts to the last.

His endurance of study and application at the microscope was surprising. I have known him persevere for days and weeks together, in order to overcome some difficult point regarding which he felt anxious. If a difficulty proved too much at one time, he would put the subject aside without coming to any opinion, and take it up again on a more favourable opportunity; never losing sight of the object, without dwelling on it fruitlessly. He was fond of society, but disliked to go out to it, and unlike most men of studious habits, he never seemed impatient of interruption, but on the contrary was always ready to enter into light jocular or other conversation however he might be employed. Of his pursuits he seldom spoke, and disliked to be questioned much on the subject, not from any reserve or desire to make a mystery of the matter, for his papers lay carelessly

about on all sides, but because he seemed desirous of availing himself of other subjects of conversation when he could.

In Microscopes he took a great interest, and was familiar with the relative merits of all the celebrated makers; Ross of London was his favourite.

His friend Mr. G~~ont~~ obtained the best that could be had at various times from continental makers, with the view of comparing them with Ross's, and when obliged on such occasions to confess the superiority of the fine movements and the transparency of the higher powers of the London microscope, Mr. Griffith's countenance invariably exhibited a triumphant expression in favour of British workmanship, highly characteristic of his patriotic sentiments in all things.

He formerly used the simple microscope with triplet lens for his dissections, because it was preferred by Mr. Brown the great English botanist. Latterly the nature of his researches on the development of the ovula in plants, rendered the highest powers of Ross's most improved compound microscope necessary.

His first and only patron and steady friend throughout life, was Richard Horseman Solly, Esq. who had the merit of being the first to discover his genius for botanical and microscopical research. He regarded the interest taken by this gentleman in his early efforts with peculiar gratitude, which he remembered to the last, bequeathing his microscopes to him in his Will. The results of his labours in the higher walks of botanical science were freely transmitted to Mr. Solly, to make any use he chose of them. Mr. Solly always brought them before the Linnæan Society, in whose Proceedings and Transactions they have successively appeared, and are still appearing, some being now in course of publication. He never allowed his confidence in a friend to be shaken of whose consistency and judgment he had once formed a favourable opinion. In Botany there were few whose observations he confided in, but his more important

papers were generally submitted to Mr. Brown, whose opinion was law to him.

I have known papers that occupied him for years to have been sent home to Mr. Solly and eighteen months or two years elapse without hearing of them. He would then perhaps, beginning to despair, remark with the most perfect resignation, that Mr. Brown may be dissatisfied. Such was his remark regarding the paper on the Ovulum in the 19th vol. of Transactions, Linnæan Society, though it will place Mr. Griffith on a level with the first physiologists of Germany. Since his death, the part of the Transactions in question containing this paper has arrived at Calcutta. It chiefly consists of a continuation of his attempts to trace the changes in the ovulum from the period of fœcundation to the development of the new individual; this profound subject being beautifully illustrated by his pencil and his pen. The proceedings of the same Society for the past year also arrived by the same opportunity, shewing Mr. Griffith to have occupied the attention of that learned body for three successive evenings, while his papers on Root Parasites and other subjects of high interest were read. So that we have not had him all to ourselves in Calcutta during the past two years, however the extent of his labours among us may have led to such a supposition.

But the discovery of these additional proofs of his zeal and talents, only renders us more sensible to the loss we have sustained by his premature death.

12th March, 1845.

The foregoing remarks, though kindly designated a memoir in the proceedings of the Society which have taken place on the melancholy occasion, were only intended to furnish such particulars as, in justice to his memory should be made known with as little delay as possible. The memoir of such a man should not be attempted hastily, and should

be carefully drawn up from authentic documents, and other sources of exact information. His exertions have been extended over so many different parts of India that it would be impossible for an individual in one place to supply a faithful detail of them. Many of the circumstances adverted to may possibly be incorrectly, while most of them are insufficiently stated. I would therefore hope that some of the numerous sincere friends he has left throughout the country would kindly correct any errors into which I may have fallen regarding particular instances of his service, and supply other particulars regarding them which I may have omitted. Notices made with this view will doubtless find ready insertion in the public Journals, and more particularly in that of the Agri-Horticultural Society. Should any such communications (not of sufficient importance for separate publication,) be entrusted to me, I will carefully preserve them with the view of contributing at some future period, towards a memoir more worthy of the subject than the present imperfect sketch.

J. M'CLELLAND.

Notes.

Privations and Dangers to which his Pursuits exposed him.

First Para. Page 7.—On one occasion during our journey to Assam, night overtook us, and we had to spend it in the forest without shelter.

On another occasion, making an excursion from Gabrew Purbu, one of the tea localities in Assam, into the adjoining Naga mountains, night overtook us in a forest; the weather was threatening, and we had just time to cut down a few branches for shelter when a storm of thunder and rain came on, such as is only experienced in the Terrai. The storm lasted for three days without intermission. We were 20 miles beyond the British boundary, in a country inhabited by one of the most hostile tribes of Natives on the frontier, whose observation we hoped to elude; but notwithstanding the deserted

character of the place, and the torrents of rain which continued to fall, a crowd of Nagas armed with spears, appeared at day-break on an eminence within a hundred yards of us. The tribe were notorious for their depredations on the outposts of the Assam Light Infantry, occasionally decapitating at night, whole guards as they lay asleep. But we were in a rich botanical locality, and the thunder and rain and hostile natives had no effect in repressing his botanical ardour, which he indulged without shelter, under a continued storm of rain and thunder for three days.

In his journey alone into the Mishmee mountains, during six weeks he could have had no shelter except when admitted into native huts, not always met with, nor often accessible to the stranger. On the journey also performed alone from Assam into Burma, a great portion of the intermediate tract was quite uninhabited; there, he could have had no shelter for two or three months. Nor could he have had much in his canoe for three weeks or a month when descending the Irrawaddy. On these occasions, he relied chiefly on a thick cloak. For food he relied upon yams, and whatever he could shoot.

In warm seasons and climates, his day's journey was usually over by nine o'clock; and, after a hasty breakfast, the labour of the day would commence with an examination of the plants collected during the morning, while his people were employed in drying collections. In mountain countries he breakfasted at day-break, the difficulties of travelling and diversity of objects met with to occasion delay, rendering any other meal uncertain.

The nature of his pursuits, (which required that his journeys should be performed on foot,) constantly led him into jungles where marks of tigers and other wild animals would have deterred any one less accustomed than himself to danger, or less ardent in the pursuit of knowledge from entering. He always preferred when prosecuting his enquiries, the bed of some dark rivulet overhung with forest, and canopies of climbers, to an open road, even though compelled to wade, as I have often known him for days, knee-deep in water. To such exposure of his valuable life and health are due, the riches and value of his collections.

His Zeal.

In the Botanic Garden, during his superintendence, rude ladders may have been observed leaning on certain trees on which any peculiar flowers appeared; these were to enable him at stated intervals to inspect the changes taking place in the inflorescence and fructification, fresh portions of which were daily found upon his table, and under his microscope. So anxious was he to take advantage of the rare plants constantly coming into flower in the Botanic Garden, and which never before had been investigated, that as the brief period of his superintendence drew towards a close, he postponed every other duty to attend to them; and when eventually displaced from the Garden by the return of Dr. Wallich, he applied for six

months' leave, ostensibly on private affairs, but really to enable him to dispose of heavy arrears of public engagements, which had accumulated on his hands; such as the arrangement and dispatch of collections to the Court of Directors, the printing of Dr. Voigt's "*Hortus Suburbanus*," &c. &c. On his death-bed he regretted that his papers were not in better order, and expressed a hope that Mrs. Griffith would be able to assist in their publication, as also his sister Miss Griffith, whose great ability in drawing, might aid in preparing the plates for the press. The publication of his vast collections, is a work in which the very general co-operation of botanists would be nobly bestowed.

Honours conferred upon him.

The following are the copies of the *Calcutta Journal of Natural History*, alluded to in the resolution of the Society, now at its disposal, to raise a fund for the publication of his MSS. Vol. I, 56 copies; vol. II, 106 ditto; vol. III, 151 ditto; vol. IV, 196 ditto; vol. V, 213 ditto. These are the only complete sets, now I believe on sale.

Besides the Horticultural, and several other English Societies of which he was spontaneously elected corresponding member—honorary distinctions conferred without application on his part, or the payment of any fee—he was in the same manner appointed in 1840, a member of the Imperial Academy at Bonn. The following year a similar honor was conferred upon him by the Royal Botanical Society of Ratisbon; and in 1844, the Royal Academy of Sciences at Turin, conferred a like honor upon him. In his case such distinctions were no less creditable to the learned Societies from which they emanated, than they were to the individual on whom they were conferred.

It is intended, (I have been given to understand,) to erect a Mural Tablet to his memory either in the great theatre of the Medical College, or in the apartment assigned through his exertions to the purposes of a Botanical Museum. In thus commemorating his connection with the Medical College, the Council of Public Instruction hold up a bright example to the Students, which ought to exercise a beneficial influence on their minds. Having been asked for an inscription for the proposed tablet, the following was suggested, which I believe met the approbation of Dr. Mouat. It is said in a recent report of the Council of Education, that it was Mr. Griffith's intention had he been spared, to have published a Botanical Manual for the medical Students. This, in fact, was the first thing he proposed to do on taking charge of his class in 1842, but before entering on the task, he was requested to supply an estimate of the expense, about 1,500 Rs. The sum was however thought too much, and he was thus reluctantly obliged to abandon the object for the time.

TO THE MEMORY
OF WILLIAM GRIFFITH, ESQ. F.L.S. ETC.

*Madras Medical Service, Born at Ham in the county of Surry
March, 1810.*

AS PROFESSOR OF BOTANY IN THIS COLLEGE
HE WAS DISTINGUISHED BY THE ZEAL AND ACTIVITY
WITH WHICH HE IMPARTED THE KNOWLEDGE
HE HAD HIMSELF ACQUIRED BY PERSONAL INVESTIGATION
IN THE DIFFERENT PROVINCES OF BRITISH INDIA, AND IN THE
NEIGHBOURING KINGDOMS
FROM THE BANKS OF THE HELMUNT AND OXUS
TO THE STRAITS OF MALACCA
WHERE, IN THE CAPACITY OF CIVIL ASSISTANT SURGEON
HE DIED 9TH FEB. 1845, IN THE 34TH YEAR OF HIS AGE,
AND THE 13TH YEAR OF HIS PUBLIC SERVICE IN INDIA.
HIS EARLY LOSS IS DEEPLY DEPLORED BY THE HEAD OF THE
GOVERNMENT OF INDIA, AND BY THE LEADING
NATURAL HISTORIANS OF HIS TIME.
HE BEQUEATHED LARGE COLLECTIONS OF PLANTS AND MSS.
TO THE HONORABLE THE COURT OF DIRECTORS OF THE EAST
INDIA COMPANY.

In addition to the erection of the proposed Tablet, I would suggest that the important Botanical diagrams illustrative of the structure of the various orders and families of plants, which he presented to the College for the use of the Students, be lithographed to the extent of 50 or 100 copies at least for distribution to other Schools and Colleges throughout the country, in which Botanical science is, or may be taught in India. And further, that a few sets be transmitted to the Hon'ble the Court of Directors, for distribution if necessary throughout the Botanical schools and institutions of Great Britain and Ireland. This would be no more than an act of justice, particularly as regards such of these diagrams as are the result of his own dissections and drawings, as the greater part of them are.

For a plain marble Tomb to be erected at Malacca by his brother Captain Griffith, and a few of his own most intimate personal friends, the following inscription is proposed :—

GULIELMUS GRIFFITH,

*Societ. Linn. Lond. Soc. ; Acad. Cæs. Nat. Cur. Bon. ; Soc. Reg. Bot.
Ratisb. ; Acad. Reg. Scien. Turin. Socius. etc.*

VIR MAGNI INGENII AC INDUSTRIÆ

NATURALIBUS SCIENTIIS PROMOVENDIS TOTUS INCUMBENS

PLURIMAS INDIAE BRITANNICAE PROVINCIAS

NEC NON REGIONES BURMANICAS AFGHANISTANICAS BOOTANICAS

SUMMO STUDIO ET LABORE PERÆGRAVIT

MISHMEOS, KASYAOS, HIMALAYAOSQUE MONTES PERLUSTRAVIT.

QUÆ IPSE MAGNA DILIGENTIA ET SOLERTIA COGNOVERAT

VOCE AC SCRIPTIS ILLUSTRAVIT.

**CUM BOTANICÆ PROFESSORIS PARTES CALCUTTÆ PER BIENNIUM
PARTES EGISSET,**

VIRIS DOCTISSIMIS IN HONORE HABITUS, AMICIS APPRIME CHARUS,

MALACCÆ MEDICI CIVILIS OFFICIO FUNGENS

OBIIT DIE 9 FEB. A. D. 1845 ÆTATIS SUÆ 34.

The friends who have been invited to join in this mark of respect to his remains, are Sir W. Norris, J. W. Grant, Esq. C. S., D. F. McLeod, Esq. C. S., J. F. Cathcart Esq. C. S., Major Jenkins, Commissioner of Assam, Capt. Durand, Commissioner of the Tenasserim Provinces, Robt. Wight, Esq. Superintending Surgeon Madras Service, J. C. Marshman, Esq., H. M. Low, Esq., Willis Earle, Esq., W. Ridsdale, Esq., W. M. Westermann, Esq., J. W. Masters, Esq., Dr. Cantor, and J. M'Clelland.

He was appointed Superintendent of the Botanic Garden in August 1842 by Mr. Bird, and it is but just to his friends, Messrs. J. W. Grant and J. C. Marshman, to say they interested themselves much in his favour, which was the more necessary, as his distance from Calcutta at the time, and the urgency of the occasion seemed together with other interests to preclude his appointment. This difficulty was however removed by the nomination of Mr. Marshman's brother-in-law the late Mr. Voigt, a learned botanist on the spot, to the charge of the Garden until the arrival of Mr. Griffith from Malacca.

This arrangement took all parties interested in it by surprise; and the result reflects the highest honour on those who brought it

about. For it not only afforded Mr. Griffith an opportunity of becoming known and appreciated in Calcutta for his amiable character, and high personal qualities which had been here greatly misunderstood, but in addition to his other exertions it enabled him to carry through the press in a superior manner, the *Hortus Suburbanus Calcuttensis* (all but the Index) the important posthumous work of his late friend, Mr. Voigt.

His reputation as a Practical Scientific Gardener.

The estimation in which he stood in Europe as a practical man, may be gathered from the nature and extent of his correspondence. Letters of the most eminent botanists, both at home and abroad, which have reached India for him by the last two mails, and which his lamented death has thrown into my hands, afford some insight to this.

The first is from Mr. Ward, an eminent horticulturist and practical botanist, whose invention of air-tight cases for the transmission of plants, has already conferred the most important services on society, from the security with which an interchange of plants may be effected by this means between the most distant parts of the world. Mr. Ward, it is to be remarked, was his fellow student, not only in University College, but in the Nursery's Gardens in and about London, where it ought to have been stated in the preceding sketch, he spent his time for years, and laid the first foundation of his botanical knowledge. Mr. Ward's letter is dated London 30th November, 1844.

"I am sure there is no one in India but yourself, who would, or could do justice to the Botanic Garden, and to the increasing calls and wants of science. The researches of Liebig and others have opened such an enlarged field of research, and that of the most interesting kind as connected with the physiology of vegetation, that a *well prepared* mind alone can fully carry out such investigations. These, however, you will carry out at Malacca, in the garden of nature; although not perhaps with the same success as where you have the power of assorting your tribes together. I have to thank you most heartily for your contributions to my herbarium; you cannot conceive the delight they have conferred upon me in many a weary and painful hour, my only regret being this, I cannot pay you in kind, &c."

The next token of his skill as a practical gardener, to which I would allude, is afforded by the Horticultural Society of England, which referred to his personal experience and special investigation, certain points connected with acclimating the plantain, and certain other fruit trees in England. The communication adverted to, he received only in December last, and was taken with him to Malacca, there to follow out its objects, and where it will be found amongst his papers. It will form a suitable article for a future number of the Society's Journal, when the Horticultural Society of England will doubtless be gratified to find any practical gardener or botanist in Bengal, to supply the requisite desiderata. I am particular on this

point, because science and practice are sometimes, though falsely supposed to be incompatible, particularly when it is sought to detract from the value of the former.

His reputation as a Practical Botanist.

The next letter is from Sir William Hooker, Director of Kew Gardens, dated Oct. 29, 1844. "I shall be glad to hear if you can give me any hope of your coming to England. I would be your guide in Kew Gardens, for you would not recognise them again; you shall look through my plants and select *ad libitum* as Hervey has done, who has taken away 5400 *species* for the Dublin University, without sensibly diminishing my packets. It will be more difficult to make your selection, because you desire plants to illustrate genera, or the species of Northern India, and I should almost despair of its being done satisfactorily, except by yourself. For yourself, I cannot but think you will soon be back to Calcutta, where you will carry out your improvements, &c."

Sir William then enters into critical botanical details, shewing the confidence with which he regarded Mr. Griffith's judgment as a Practical Botanist.

The next letter is from Professor Von Martius, it is dated, Munich, 6th January, 1845.

"I do not know whether you have received the last books I sent you, they shall be followed with the Parts of the *Flora Brassiliensis* as they are published. The work goes on slowly; but after the completion of my Palms, I shall have no interruption.

"Your collections will contribute much to the value of my History of Palms. I have examined your excellent work on Indian Palms with much interest, and with the aid of the specimens when they arrive, I will be able to make them all out. In the mean time I have printed the *Genus Phoenix*, and I transcribe and forward herewith a synopsis of the Indian ones, and should be happy if you could turn the communication to account.

"In September last I had the pleasure of seeing Mr. Robert Brown here. He remained with me a month at Munich, where he assisted at the meeting of the German Agriculturists in the Bavarian Alps. He was in high spirits, and we went over all the leading chapters of our science together; every where he evinced a familiarity with facts and structure quite surprising, indicating what is to be done, and where improvement is to be expected. *He agrees with me in appreciating your spirited and enlightened investigations, and I now more than ever, look forward with you to confidence as his successor—as the standard English botanist.* I have been for some time past expecting a collection of Brazilian plants, directed to be made for me by the Emperor; when they arrive I shall despatch a portion of them to you. You tell me that Mr. Wallich has resumed charge of the Gardens, but you do not say whether your occupations will keep you in Calcutta, or where I am to direct my letters in future. On these points be so good as

to inform me in your next letter, which I shall be anxiously looking forward to, &c."

His Character as an Indian Botanist.

The next letter, is written after the news of his death, by Dr. Wight, Superintending Surgeon Madras service, Author of the "Prodromus Floræ Peninsulæ Indiæ Orientalis," "Illustrations of Indian Botany, Icones Plantarum," &c.

It is dated Coimboitore, 25th March, 1845.

"I have also been thinking what could be done towards the preservation of his valuable notes and MSS. the result of so much labour and deep reflection on vegetable structure and affinities, &c. I have thought to no purpose for want of data, I shall therefore look forward with much anxiety for your promised letter, which will, I hope, put me in possession of some information on which at least to ground a suggestion, should I be unable to do more than offer one. In the meantime I may as well mention that, should circumstances so turn out, that you think I can be of any use, my services are at your disposal. It certainly seems most desirable that steps should be taken to preserve such invaluable records of most untiring industry, guided by transcendent talents; and I as yet see no better way of doing so, than by at once collecting and arranging them for immediate publication. To aid in such a work, would be to me a labour of love towards my late inestimable friend, and I should gladly assist in it to the extent of my imperfect acquaintance with the deep workings of his mind. To do them justice will be no easy matter I am well aware, for even in the present advanced state of botanical science, he was far ahead of his generation; but an imperfect record would be still better than none. Even with all its imperfections, such a work would do much towards preserving his memory, and stamping him as one of the most able and industrious men of his age. But enough for the present, as all these points can be better discussed when we know what were his wishes regarding them."

Mr. Gardner, the Superintendent of the Royal Botanic Garden at Ceylon, writes.

"It was with extreme sorrow that I heard of the death of poor Mr. Griffith; although personally unknown to me, I have long been an admirer of his rich talents and highly philosophical mind. His career has indeed been short, but he has left a name, and a fame behind him which but few can attain to, even with patriarchal years. India has never had such a botanist on her shores, and I fear it will be long ere such another makes his appearance."

Mr. Jameson, Superintendent of the Botanic Gardens, North West Provinces, writes.

"I learn from the papers the melancholy death of poor Mr. Griffith; in him the Government have lost one of the brightest ornaments of the Service. By his intrinsic worth alone he placed himself in the most prominent, and distinguished position in the scientific world." &c.

The Claims of his Family.

During the period* of his service in India, nearly 13 years, he was employed in a strictly botanical capacity, only about 2½ years; namely, when a Member of the Assam deputation, and when officiating at the Botanic Garden. His subsequent employment in Assam, in the Mishmee Mountains, in Burma, and in Affganis-
than, had as much of political, as of botanical or scientific object. His original employment in the Tenaserim Provinces, as well as his employment with the mission of Major Pemberton to Bootan, and his late employment in the Straits, was in his medical capacity.

With regard to his allowances at Malacca, they were very small, the smallest an officer of his length of service could have, while the nature of his pursuits was incompatible both with private medical practice and with trade, by means of which medical officers on small pay occasionally augment their income. On the other hand, the expences of his pursuits swallowed all his pay, so that I know him on this account to have denied himself many personal conveniences to which he had been accustomed, and which were essential to a man of his engagements, rather than incur debt of which he had a just dread.

Thus, no servant of the East India Company possessing such a reputation, ever accomplished so much as he has done at so little expence to the State.

If, as I think we must allow, the highest object of human life, so far at least as the general interests of Society are concerned, is to unfold to the understanding the hidden mysteries, the harmonies, and resources of nature, on the right comprehension and use of which, social order and improvement depend; few men will be found to have contributed more to the dignity of our nature, and the good of his fellow creatures, than Mr. Griffith.

Considering the humble means at his disposal, and the benevolence and generosity of his disposition, there cannot be a doubt that the immense materials he accumulated for the advancement of knowledge, were collected and brought together at the expence of his family, to whom he would otherwise have contributed the pecuniary means he devoted to his pursuits.

Hence we would very earnestly commend the helpless portion of his family, the Infant, the Widow, and the three Maiden Sisters whose hopes were centred in him, to the generosity and care of those to whom the destinies of India are entrusted. If ever they had a faithful servant, devoted to their interest, and to the advancement of science, and of civilization, in the nations which they govern, it was William Griffith.

He has given a tone to scientific inquiry in India, and a character to the public service, which cannot fail to inspire a favourable impression of the East India Company's Government, in the minds of scientific men in all parts of the world, while he has set a bright example to those of India.

*Correspondence connected with the supposed discovery of a
Teak Forest on the banks of the Koladyne river, in Ar-
racan.*

(Communicated by the Government of Bengal.)

*To J. HUME, Esq. Honorary Secretary, Agricultural and Horticultural
Society.*

Revenue.

SIR,—With reference to your letter dated the 16th November last, I have the honour to transmit the accompanying copy of a letter No. 6, from the Commissioner of Arracan, dated the 30th November last, with enclosures, on the subject of Teak Forests in that Province.

I have, &c.

CECIL BEADON.

Under Secy. to the Govt. of Bengal.

Fort William, 29th Jan. 1845.

*To the Secretary to the Government of Bengal, Home
Department, Fort William.*

SIR,—It having been strongly insisted upon, within the last few months, that an extensive and heretofore unknown forest of Teak wood existed at a place on the banks of the Koladyne, about 100 miles up that river from Akyab, from whence a very superior log of Teak was presented to me by Mr. W. D. Brown, merchant of this place, I lately deemed it expedient to depute Lieut. Hopkinson, Junior Assistant Commissioner, to investigate the matter in the hope that a valuable discovery had really been made, and I would have transmitted his report at a much earlier period, had I not been in expectation of receiving a somewhat similar document from Capt. Phayre, with reference to the existence of Teak trees in the Sandoway district, and also a report through Colonel Irvine, C. B. Superintendent of Marine, upon the quality of some of the specimens of the wood

which I sometime since forwarded to Calcutta, which might enable me to dispose of the subject in a complete manner.

2. I have now the honour to submit herewith copies of the documents noted in the margin,* and I much regret that the results of my Assistant's enquiries should have proved so little satisfactory. So far from a new forest having been discovered as I most earnestly hoped, it appears from Lieut. Hopkinson's report, that the site of the trees shewn to him is identical with that known to myself and Assistants, years ago, and that the trees to which we attached little importance because of the paucity of any of good size, and the almost insuperable difficulties opposed to their removal, are neither larger nor more abundant than was supposed, while the difficulties of getting at them may be imagined from the fact that even in September, Lieutenant Hopkinson had to quit his boat six days below the spot, and proceed up in a covered canoe, and when he got there he had to scramble over hills and rocks, which he could only traverse in safety bare footed, and availing himself of every twig and branch, and an iron shod stick as a support. In short, from his description of the locality it is unfortunately but too manifest, that whatever quantity of Teak there may be in the mountains through which the Koladyne flows, they cannot be removed except at an expense which would render the speculation wholly unprofitable.

3. This is the more to be regretted as it appears from the annexed report of the H. C. Marine Surveyor, and ship builder, on specimens sent by me to Calcutta, and for which report I am indebted to the kindness of Colonel Irvine, C. B., that the wood is really of very excellent quality.†

* Junior Assistant to Commissioner, dated 8th October, 1844.

Captain Phayre to Commissioner, dated 1st November, 1844.

Mr. Simpson to Col. Irvine, C. B., dated 2nd November, 1844.

† A report by Capt. Goodwyn on the quality of a piece of Arracan teak, forwarded by Major Bogle to the Society, will be found in vol. III, page 218.—*Eds.*

4. Of the red Jarool alluded to by Mr. Simpson, there is a great abundance in Arracan, as indeed there is of several other valuable descriptions of Timber.

5. From Capt. Phayre's report it does not appear that the Teak trees in the Sandoway district which he visited, are more valuable than those seen by Lieut. Hopkinson, in short it is evident that there is no teak forest in Arracan, but it cannot be doubted that the tree will grow very well in this Province, more especially along the foot of the different ranges of hills, and the only question is whether it would be worth while to take any steps on the part of Govt. to plant forests. I am aware that many years ago some Govt. forests were planted in Bengal, but I know not what has become of them. It is probable that the supply of Teak wood now obtained from Moulmein and the Malabar coast, is sufficiently abundant to render it inexpedient to devote any expence or particular attention to the rearing of trees elsewhere on Govt. account, and therefore I will not dwell further on the matter.

6. Both Capt. Phayre and Lieut. Hopkinson seem to have done all that was required of them, the latter in particular at very considerable personal toil and inconvenience, and I am extremely obliged to them for the trouble they have been at.

I have the honor to be, &c.

(Signed) A. BOGLE,

*Arracan Commissioner's Office,
Akyab, 30th November, 1844.*

Commissioner of Arracan.

To Captain A. BOGLE, Commissioner of Arracan, Akyab.

SIR,—Having returned from my mission up the Koladyne river, undertaken by your instructions, with the view of verifying the accuracy of the information contributed by Mr. Brown, on native authority, of the existence of a Teak forest of considerable extent, and in a situation on the left

bank of the Oothalong Kyong, a small tributary of the Koladyne, offering the greatest facilities for the transport of the Timber ; I have now the honor to submit the result of my observations, which were made as accurately as the nature of the locality would admit.

2. To begin, I am afraid I cannot concede to Mr. Brown or his native informants any honor that may be supposed to attach to this so called discovery of a new Teak forest. I find the locality to be identical with that which has now for some years been well known to exist, to those whose connection with the management of the district would put them in the way of acquiring such knowledge. Capt. Phayre in a communication to you as far back as 1839, notices the fact of Teak being found near the Oothalong, and Mr. Brown's servants themselves were conducted to where the Teak grew by the Kyouk of the Koladyne circle, who may be looked upon as the natural depository of all statistical information appertaining to his particular circle, and who in fact as I may bring to your remembrance, procured a small Teak log for you on a former occasion ; I have also heard vague stories of specimens of Teak wood having been procured in Arracan by Mr. Commr. Hunter, and sent for inspection and trial to Calcutta, and in some tables now before me, compiled by Captain Baker, of the Engineers, on the relative strength &c. of various kinds of Timber, I find with Rangoon, Pegu, and Malabar teak, *Mugh* gun carriage teak plank also compared, which from the name one would he led to infer, came from this Province.

3. The parties who originally brought to our notice the existence of Teak would of course be questioned, and would be able to answer as to its extent, and the possibility of working it profitably, and they did accordingly report, that the trees were few in number, deficient in girth, scattered here and there, growing on high hills in different situations. So discouraging a statement was not likely to stimulate further

enquiry, and little attention was paid to the subject, until Mr. Brown's magnificent representation, invested it anew with a character of such importance, as to render it in the highest degree desirable, that more minute investigations should be immediately instituted. You were pleased to intrust me with the conduct of the investigations, and the result of my observations and enquires, I regret to inform you, only confirm in every particular, the truthfulness and correctness of the accounts we had previously received. Of the facility of transport I will speak hereafter, of the trees themselves, all I can report is, that they are situated on a declivity of a steep hill or mountain, in a dense and almost impervious jungle, for the most part Bamboo, interspersed with various kinds of forest trees, Teak among the rest, but by no means predominant. I visited the spot on two occasions and plunged into the depth of the jungle to see all that was to be seen, but I feel confident that I did not meet with sixty teaks and these by no means what I should think would be considered fine specimens. I could only count six, (what were evidently looked upon by the natives as "show" trees,) but there might have been eight or ten that barked and trimmed would have yielded a cubic foot of material, the others were mere saplings averaging with bark and all perhaps eight or nine inches in diameter and fitted at most for light spars, and topmasts of small boats, they were very high however, running some fifty or sixty feet. I was assured by those who accompanied me, the Kyouk among the rest, that I had seen all the trees that the natives knew of themselves, and I have no doubt that this is the truth; but neither they nor I can say what may be found in the further recesses of these primeval forests. I may notice here that the soil would appear admirably adapted for the production of Teak or any other tree, consisting of a soft friable clayey slate and disintegrated sand stone with a very rich deposit of vegetable mould.

4. In considering the accessibility of the place, I should say that nothing short of a profusion of Teak of the very largest and finest quality could compensate the speculator for cutting it in such a situation, and then not without the application of much energy, attention and mechanical skill, he would I think have difficulties of a very formidable nature to contend with before he could get his timber to the Koladyne, and the supervision of a skilful European mechanic would be absolutely necessary. The mouth of the Oothalong Kyong, is about an hour's row from Krakys Village. I arrived off it at 8 P. M. in a light canoe extremely well manned, but I was five hours and a half in ascending to, where the mouth of a small water course on the left bank, marks the road to the teak locality, and although it was yet the rainy season and much rain had actually fallen, the Oothalong was so shallow in many places that my rowers were constantly obliged to jump out and drag the boat by main force over the bed of the nullah, and in descending, the deficiency of water was much greater, though only one day had intervened, thus showing, that this nullah could only be of use for floating timber at the very height of the rain floods, and then even the necessary rapidity of the current and the short and sudden turnings of the nullah, would not be without their difficulty. Landing at the mouth of the water course to which I have above alluded, an hour and a half of brisk walking brought me to the first teak tree, the road gradually ascending and following in the exact bed of the torrent, which I found quite dry except where at the foot of the steeper declivities small pools of water, in some places of considerable depth, remained. The difficulty of moving may be imagined, when I state, that it was only by going bare foot, and with the assistance of an iron-shod stick, that I could manage to ascend the huge slippery beds of sandstone and slate that obstructed my route, which yet impracticable as it may be,

is the only one available for the transport of even the most accessible of the trees; much of course might be done, were the returns likely to make up for the outlay, by levelling and improving the road, and by the use of rollers, windlasses, and other mechanical appliances; but to conclude, as things are at present, and with present facilities, I do not think, with the best arrangements, that the most enterprising individual, were he to cut, bring down to Akyab, and ship to Calcutta, every stick of Teak yet discovered, would realize a clear profit of six hundred rupees.

I have, &c. &c.

(Signed) H. HOPKINSON,

Junior Assistant Commissioner.

*J. A. A. C. Office, Akyab,
the 8th October, 1844.*

To Major A. BOGLE, Commissioner of Arracan.

SIR,—I have the honour to report to you, that hearing of the existence of the Teak tree in the circle of Toungoop in the Sandoway district, I proceeded from my station towards that place on the night of the 27th October.

Having reached the village of Kanboing, the residence of the Thoogyee of the circle, I proceeded on the 31st to the spot where the trees stand. They are situated about three miles in an easterly direction from the village of Kanboing. They stand upon two small hillocks close to each other, and each containing from three to four acres of land, partly also on the side of a larger hill immediately adjoining; the whole in fact are connected together with scarcely any interval. There are the Pyeen or Iron wood, and other forest trees mixed with them. I only found two Teak trees of a diameter extending to two feet; one of these was crooked, and both diminished to a diameter of one foot, at a height of ten or twelve feet above the ground; the greater portion of the trees did not exceed ten or twelve inches in

diameter, and 40 or 50 feet in height above the ground, they were scattered about at intervals of twelve or fifteen feet apart of all sizes, from the seedling of last year to those of the dimensions I have mentioned above. I saw only two trees (the large ones before mentioned) which it appeared to me, would be any object to a timber merchant. The total number of Teak trees upon the two hillocks, and the side of the larger hill, is about one hundred and fifty.

From enquiries I made in the vicinity, I have no doubt that these Teak trees were not originally indigenous to the soil; the tradition concerning them is that they were planted upon this site by two brothers, settlers from the eastward, (Burmah proper), and it is agreed upon by all the neighbouring "oldest inhabitants" that this occurred before the Burmese conquest of Arracan in A. D. 1784; from this and other circumstances, I have little doubt but that the plantation was made about one hundred years ago. I do not suppose that any of the original trees now exist, for though I am not conversant with the ratio of growth for age among trees in general, and have no data regarding that of the Teak tree, yet none of those I saw, except the two larger ones, appeared to me to require more than twenty years to reach the size they had attained. There is no doubt also from what I heard, that some large Teak trees have within the last twenty years, been cut down upon this spot by the neighbouring villagers for boats and other purposes. Indeed, I saw the stump of two small trees which had evidently been cut down lately. As all forest land and produce in Arracan are the property of Government, and it may be considered an object to preserve these Teak trees, I have for the present strictly prohibited any more being cut down until I receive your orders on the subject. Should it ever become an object to cut trees upon this spot, they can be removed without difficulty to Kanboing village, which stands upon the Toungoop river, about ten miles from the

sea. To this village, boats drawing 5 feet of water can approach during the spring tides. I have, &c. &c.

(Signed,) A. P. PHAYRE,

Lieut. and Bt. Capt. Senr. Asst. to Commr.

On board the Schooner "Swift,"

Toungoo river, 1st November, 1844.

To JAMES SUTHERLAND, Esq. Secretary to the Superintendent of Marine.

SIR,—With reference to your letter No. 948, dated the 30th August, 1844, and enclosed therein in original a letter No. 115, dated the 22d of the said month from Captain Bogle, Commissioner of Arracan, respecting a certain piece of Teak timber sent here in the "Amherst" for the purpose of testing and reporting of its quality,—I beg now to state that notwithstanding the piece was lately cut, as stated, still I am led to believe it is the growth of good soil, and the scent of it is as good as Rangoon or Moulmein Teak.

The last piece of Teak timber, and which was forwarded to the Superintendent in the "Amherst," and received in the Government Dock Yard, is well seasoned, and appears to be as good as either Moulmain or Rangoon Teak.

This was a part of the same tree with the above.
A. Bogle.

From the general statement given in by Captain Bogle, it would be advisable to hold out encouragement to the Mughs, to get into the interior of the country for the purpose of cutting down Teak timbers, and as for red Jarool it is in high repute, as all the ships that were built in Chittagong, the frame timbers and bottom plank was of Jarool wood; the texture is knotty and hard, but what is termed white Jarool is quite pithy and not fit for any standing work.

I have, &c.

*Kidderpore, Govt. Dock Yard,
the 2d November, 1844.*

(Signed) J. SIMPSON,
Builder and Surveyor.

Report on the existence of Teak trees on the Banks of the Thaddé stream, in the vicinity of Sandoway.

(Communicated by the Government of Bengal.) •

To J. HUME, Esq. Honorary Secretary, Agricultural and Horticultural Society.

Revenue.

SIR,—In continuation of my letter No. 96 of the 29th ultimo, I have the honor to forward for the Society's information copy of a further report from the Commissioner of Arracan, dated 23rd ultimo, shewing the existence of teak trees on the borders of the Thaddé Stream near Sandoway.

I have &c.

CECIL BEADON,

Under Secy. to the Govt. of Bengal.

Fort William, 12th February, 1845.

To the Secretary to the Government of Bengal, Home Department.

SIR,—In continuation of my communication, No. 6, dated the 30th November last, regarding the teak localities of this province, I have now the honor to submit copy of a letter No. 1205 of the 27th ultimo, from Capt. Phayre, Senior Assistant Commissioner at Sandoway, reporting the existence of some teak trees on the banks of the Thaddé stream not far from his station.

2. I believe this to be the very first mention ever made of these trees, and I see no reason to doubt that they are indigenous; it is to be regretted that there are so few of them.

3. Capt. Phayre laments the migration of the mountaineers of the Yooma range to the plains, but I greatly rejoice at this proof of the increased confidence of these poor people in their rulers.

4. The inconveniences and privations of a mountain life are seldom encountered except to avoid tyranny and oppression in the plains; when the current of migration sets the other way, there is no cause for regret.

In a political point of view the sooner the frontier ranges become a howling wilderness, the better, for the stronger and more impassable will be the barrier between Ava and Arracan.

5. I should be glad if all the passes to which Captain Phayre alludes could be blocked up for ever. We can never want them either in peace or war, and they are only of value to Burmese dacoits.

I have, &c.

(Signed,) A. BOGLE,

Commissioner of Arracan.

Arracan Comr's Office, Kyook Phyoo,

The 23rd January, 1845.

*To Major A. BOGLE, Commissioner of Arracan, Kyook
Phyoo.*

SIR,—I have the honor to report that there exist a few teak trees on the bank of the Thaddé Stream, not far from the site of the Allaygyan thannah which was removed last year.

2. These trees are of a larger size than those of Toun-goup reported on in my letter of the 1st ultimo. I should not however consider them indigenous though I could learn nothing as to when they were planted; there are about one hundred of them. Were it required to cut them down they could easily be floated down the Thaddé Stream in the rainy season.

3. While upon this subject, I regret having to report that the whole of that hill country bordering on the Yoma mountains directly east of this town is becoming depopulated, and while I was there a few days ago the last rem-

nant of the Burmese mountaineers talked of emigrating to the plains. I regret this much, as they are the only people remaining to keep up our knowledge of and connection with, an extensive tract of mountainous country containing many paths into Burma; but if they find it for their advantage to leave the higher hills, of course, I shall be very glad to see them better their condition.

4. Since the devastations of Thaidoo, the dacoit, some years back, these hills have gradually become deserted by the population, and unless any of the former people who emigrated to the Burmese dominions should again return, I much fear that in another year or two these mountains will present nothing but, as far as human inhabitants is concerned, a deserted waste.

I have, &c.

(Signed,) A. P. PHAYRE.

Senior Assistant Commissioner.

*Arracan, S. A. C. Office, Sandoway,
The 27th December, 1844.*

*Report on the Thoungyeen River, (Tenasserim Province,)
and on the Teak Forest in its vicinity.*

(Communicated by the Government of Bengal.)

To the Honorary Secretary Agricultural and Horticultural Society.

Revenue.

SIR,—I am directed by the Right Hon'ble the Governor of Bengal, to forward the accompanying copy of a Report on the Teak Forests on the Thoungyeen River, Tenasserim Provinces.

I have, &c.

CECIL BEADON.

Under Secretary to the Govt. of Bengal.

Fort William, 5th Feb. 1845.

The river Thoungyeen takes its rise in the mountains called Kyouk Kait about 120 miles from Moulmein in a S. S. Easterly direction, and continues its course nearly N. W. to Lat. $17^{\circ} 56' 46''$ N. emptying itself into the Salween river at the northernmost point of the British Territory, about 80 miles from Moulmein. Its average breadth is about 80 feet, and its waters during the N. E. monsoon are perfectly clear, with a sandy and rocky bottom. The country towards its junction with the Salween is mountainous to its very banks, but here, not a single teak tree is to be seen. Above the point at which the main road from Zimmay crosses the Thoungyeen, the country is comparatively level near the river, but gradually rises towards the ranges of mountains on either side of it.

The Tar-oke Choung is the highest forest visited by me.

Taroke Choung. The Thoungyeen here is shallow and rapid, and timber is never brought from above this point, nor does the road for elephants or men extend beyond it. It contains several hundred trees of the largest size, and of very straight growth, increasing in number towards the tops of the hills. A few hundred trees have been girdled in this forest by a Karreen named Tha-doke, late Thooghee of the Village of Koklaik, but as yet no trees have been removed, on account of the great difficulty that would occur in dragging them to the main stream, as the Tar-oke Choung is too rocky and narrow, to allow of timber to be floated down it, and even when dragged into the main stream it would require many elephants to push it along, the water being very shallow. Teak is said to be more abundant on the Shán side opposite the mouth of this stream.

The next forest below Tar-oke is on the Megualar stream
 Megualar Forest and Stream. which is equal in breadth to the Thoungyeen. This forest extends for several miles on either side of the Megualar and has been partially worked by the Karreens of that district. Teak is

the prevailing tree in this forest and grows larger than any I have seen, one measured by me was 14 feet in the girth. Young trees are growing up annually, but a great many of them are destroyed by wild elephants as well as by those used by persons employed to drag and bring down timber. The five elephants with my camp were observed to destroy, daily, numbers of young trees amounting often to 2 or 300. Nga Bean has worked in this to the extent of 7 or 800 trees, but as yet about 300 only have been removed. Teak occurs in occasional patches of from 50 to 100 trees between the Tar-oke and Megualar Choungs, but is to be found of much finer growth towards the hills.

About four miles to the Eastward of the mouth of the
Fir Forest.

Megualar stream is a fir forest, extending several miles in a N. Westerly direction; the soil on which this tree is seen to grow, is of a red gravelly nature, and the country here is never flooded. The fir does not grow to a very large size and the bark is very thick; I doubt whether a spar of three feet circumference after taking off the bark could be procured. The Karreens annually destroy a great many by making a large incision near the root of the tree for the purpose of extracting the turpentine, which they use in great quantities for making torches. Few trees of other kinds are intermixed with the fir, and young trees are growing up annually.

Following the downward course of the Thoungyeen, teak occurs in occasional patches near its banks; it is more
Kyouk Kait. plentiful near the hills called Kyouk Kait where the banks of the river are upwards of 300 feet high. There is a fall of about six feet in the bed of the river, which is caused by the projection of two rocks, between which there is not a water way of more than six feet during the dry season; this makes it very difficult for the foresters to bring down the timber from the forests above this. The usual mode of passing the hill grain down this river adopted

by the Karreens, is by raft which they form by lashing together 10 or 12 bamboos, this raft they do not hesitate to guide down the falls, but several accidents have occurred sometimes attended with loss of life. There are several villages inland between Megualar and Kyouk Kait hill.

The Specimen is marked A. One of the Karreens of Kyouk Kait brought a piece of wood to me, which he stated as being the most durable wood used by this race of people for making spears, dar handles, &c. and that this was the only place from whence it could be procured. The tree itself grows to a large size and will not float even when seasoned. The wood is not known to Burmans in Moulmain.

Twenty-two miles to the Westward of Kyouk Kait is the Old Town of Meera- old town of Meerawaddee situated in a bend waddee. Latitude of Meerawaddee 16° 33' of the river. It is surrounded by a brick wall ten feet high and 8 feet thick, in the form of a square, and has two entrances, N. and S. Nothing now remains, but the ruins of several Pagodas in the midst of jungle; fruit trees of different kinds, but principally the mangoe and jack are plentiful, on either side of the river. On the right bank or Shan side of the stream, young teak trees are very numerous, while scarcely an old tree is to be seen.

There are extensive plains commencing about five miles east of Merawaddee, which were formerly used by the inhabitants for cultivating grain. The fir forest before mentioned extends as far as the old town, but is not seen to pass the Mepelai stream. This stream is about fifty

Mepelai stream. feet broad, and takes it's rise from a hill of the same name, it is well calculated for bringing down timber of any size, and abounds in teak of very fine growth.

The Mekenai and Laumat Choungs are tributaries to this stream, and on their banks, young trees Mekenai and Lam- mat Choungs. are very numerous, but large timber is not as abundant as on the Mepelai. These forests have

been worked by the Karreens of Mekenai village, but no killed trees have as yet been felled, the fallen or dead trees only have been removed. The teak is of very straight growth on Mepelai hill, rising without branches, to the height of upwards of 100 feet; they could only be brought away by an efficient force of men and elephants.

The Thengan tree, which is used by the Burmese for Thengan Tree. making their boats, is very plentiful on Mepelai hill. On the flat country between the range of hills, and the stream, the soil is rich and of a black sandy nature, and the underwood so thick as to prevent persons penetrating it on either side of a small road or pathway, made by the Karreens in travelling from one village to another.

Teak is not to be seen for more than two miles inland, Komokala. till you arrive at Komokala, where it grows very large. The Karreens of the village of Komokala, have killed a great many trees; there are three rapids at Komokala, over which it is very difficult to float timber except during the months of December and January. The banks of the river are perpendicular, and very high.

The Padouk tree is very plentiful on this hill. Below Padouk tree. Merruai Komokala is the Merruai Choung, which is the highest point worked to any extent by the natives from Moulmein. Teak is very plentiful on this stream as well as on the smaller ones tributary to it.

Tigahore is the next stream, and one of considerable Tigahore Choung. breadth, abounding in teak of the largest dimensions. The country below Komokala is more hilly than above it, and the river is broader, with sand banks, sometimes a mile in length.

Terrapensike, so called on account of the mangoe tree Terrapensike. growing there, contains very fine teak.

Kunnoo and Wynsaw, are the two streams which have Kunnoo and Wynsaw Choungs. been mostly worked, but the whole country between the Komokala hills, and Maithee

Choung is covered with teak, and on many of the intervening streams teak is the prevailing tree. Very few of the teak trees that have been brought to Moulmein from the Thoungyeen forests, appear to have been seasoned timber, for the wood of this district will never float till the lapse of four years after girdling. The quality of the timber cannot therefore be said to have had a fair trial, for that which might have been partly seasoned has been brought down intermixed with dead timber, without which it could not have been floated.

All the tributary streams as well as the main river are full of sunken timber cut down before the tree has been properly seasoned. On each of these streams Karreen villages occur at intervals of 10 or 12 miles. These Karreens stated to me that they had only commenced killing timber four years ago, and that before that time all the timber brought away from the Thoungyeen by Burmans, was "Narthat," or trees that have perished from natural causes.

The Karreens annually destroy a great number of young trees in clearing away the jungle for their cultivation; they prefer spots where young teak abounds to any other, the soil being generally richer and well elevated. The young tree shows itself in all the Thoungyeen forests of all sizes, and bears a proportion of 10 to 1, to the old trees; in some parts, as near Meerawaddee, the young teak is seen to spread for miles and often unmixed with other young trees.

Lance wood may be procured from the hills near Maithee
Lance wood. stream, but I could not ascertain if it was procurable in any large quantity, having only met with three or four trees. It grows very straight to the height of about forty feet, and is from three to four feet in girth. It is used by the Karreens for making bows.

The next stream below Maithee of any size is the Wenive,
Wenive stream. issuing from a smaller range of mountains, connected with the Toug Ghee by small hills. Teak is

very scarce about here, for only a few patches of trees were seen by me between Maithee Choung and the main road from Zimmay to Moulmein. Below this road about half way to the mouth of the river, only one small clump of from 20 to 30 trees was seen on a small creek, but the timber was very small and of very inferior quality.

The march here is also very tedious, as along the bed of the stream is the only way practicable, crossing and recrossing it from one sand bank to another without any shelter from the sun; several elephants have died of fatigue in performing this journey.

The road from Moulmein to the higher forests on the
Roads to the Thoun- Thoungyeen is called the Koklaik-lan, as
yeen. it passes through a village of that name
Koklaik-lan. commencing at Megalan on the Houndran
river. It is of considerable breadth and practicable to
horses and elephants, where it crosses the range of moun-
tains there are three ridges, but these are neither steep nor
very high. It falls on the Thoungyeen about $3\frac{1}{2}$ miles
north of Menawaddie which may be reached by this road in
9 days, marching about 8 hours a day.

The next road below this is the Nubboo Lan which verges
Nubboo Lan. on the left bank of the Nubboo stream, a
tributary to the Shaing Bonai river and takes its rise in the
Toung Ghee Mountains.

This road is not much used at the present time, the
passage over the mountains is practicable to elephants but
not to horses or other cattle.

It reaches the Thoungyeen river opposite the village of
Melamar at the mouth of the Melamar stream and occupies
from 10 to 12 days from Moulmein.

There is another road which is generally used by the
Daunat-Lan. wood-cutters, being the shortest way to the
forests worked by natives of Moulmein, but this is far more
tedious than the other two, and very difficult to ascend.

58 *Report on the Thoungyeen River and on the Teak, &c.*

By this road the passage from Moulmein to the Thoungyeen occupies only 7 days.

Last year two elephants were killed descending Daunat Toung.

This road commences from Dargyne and crosses the Thoungyeen between the Kunnoo and Wynaene streams.

The lowest and most frequented is the main road from Zimmay, and by which the greater part of the Shan cattle is brought to Moulmein.

It leads through a gorge in the Wenive Hills, a branch of the Toung Ghee, and might be made practicable for carts or caravans between the Thoungyeen and Moulmein.

The total number of trees said to be killed on the Thoungyeen and which are claimed, is as follows:—

By Burmese,	...	...	...	...	...	...	...
Karreens,	...	...	...	...	...	...	...
The higher forests, that is from Megalar upwards, are estimated to contain,						10,000	
Mepelai stream,	...	...	...	...	...	10,000	
And the streams between Komakala and							
13 Streams between Komakala and Maithée.							
Maithee Choung upwards of							
3,000 each,	...	...	...	...	...	39,000	
Being in all, including felled trees and those fit for felling.	...	...	...	...	...	...	...

These numbers are given from information derived from the Karreen Inhabitants of the district.

(Signed) W. R. MALING.

Asst. Surveyor, Forest Dept.

Moulmein, 4th September, 1844.

A descriptive account of the tree which produces the Gutta Percha; by the Rev. EDWARD WHITE. Communicated by F. J. MOUAT, Esq., M.D.

To JAMES HUME, Esq. Honorary Secretary to the Agricultural and Horticultural Society.

SIR,—I beg leave to enclose, for insertion in the Society's Journal, the accompanying description, by the Rev. Edward White, of the tree which produces the "Gutta Percha," a subject which has attracted considerable interest, and of which a record is already contained in the Journal.*

The paper will possess an additional and melancholy interest in the estimation of the Society, when it is known that it was originally sent to the late Mr. Griffith, and reached Malacca on the very day of his death. The Rev. Mr. White of Singapore, is already known as one of the most eminent amateur Botanists in India, and was highly esteemed as such by Mr. Griffith, who regarded all his observations and contributions to the science as valuable, and worthy of record.

I have, &c.

F. J. MOUAT.

Medical College, 24th March, 1845.

Gutta Percha, Linn. Cl. Dodecandria Monogynia; Nat. Fam. related to Sapotacæ and Ebinacæ.

Trunk straight, lofty, diamr. 3 feet at base; branches numerous, ascending: terminal buds white from exuding gutta.

Leaves crowded at extremity of the branches, alternate, petiolate oblong with a small point at the apex: base tapering—length 4-5 inches, breadth 2 inches. Surface, *upper*,

* The experimental observations of Dr. Mouat, as to the chemical nature of this substance, will be found, in Vol. 2, page 101; and some further information by the late Mr. Griffith, in Vol. 3, page 143.—Eds.

bright green, feather nerved; *under*, brownish red from dense pubescence: mid-rib and petiole the same. The latter one inch long, channelled, not articulated with the stem.

Stipules 0. Flowers axillary, sessile, four together, disposed in a quadrangul manner; small and white.

Bracts 0. Calyx persistent, sepals 6 brownish-red, in a double series, three outer largest. Oestivation valvate.

Corolla monopetalous 6 cleft, lobes $\frac{1}{4}$ and tube $\frac{1}{8}$ inch long, deciduous. Oestivation tarsted.

Stamens 12 in a single series, equal, similar, inserted in the mouth of the tube. Filaments equal in length to the lobes of the corolla.

Anthers sagittate, exturse, affixed by their base to the filaments. Pollen scanty.

Ovary superior, conical, sessile, seated on a disk, 6 celled each cell containing a single ovule suspended from a central axis: funiculus conspicuous.

Style longer than the stamens, persistent; stigma undivided. The specimen was not in good condition, and I was unable to ascertain whether all the anthers are fertile: apparently not. The timber is represented as hard, and used for building prows, &c. The Malays speak of another less robust tree with similar leaf, but different in colour of its flower (red) and shape of its fruit, which yields a white, brittle and useless gutta. The fruit of the former is sweet, of the latter acid.—E. W.

THE JOURNAL
OF THE
Agricultural & Horticultural Society
I N D I A.

Observations on the applicability of Artificial Manures to the cultivation of the Sugar-cane, with some suggestions for the amelioration and extension of the Sugar cultivation in Bengal. By T. F. HENLEY, Esq.

The object proposed in the following observations will doubtless obtain for it a favorable reception on the part of every one interested in the cultivation of the Sugar-cane. No more in fact is proposed, than to request attention to the peculiar suitability of the modern concentrated artificial manures, to the cultivation of the Sugar-cane and to the position and circumstances of the Sugar Planter. Every one has heard of the immense agricultural progress which has already taken place in Europe, and more especially in England, from the application in practical farming of various salts and artificial compounds destined to fertilize the soil, and augment its produce, and replace, if necessary, the total absence of ordinary manures. Practical experience has now confirmed what science had indicated, that the fertilizing effects of ordinary manures may be obtained by the employment of

comparatively minute doses of certain salts containing the same principles.

The nature of soils and the plants they are calculated to support, have been the objects of the most exact study, and have thus permitted the determination in a precise manner of the composition of the most appropriate fertilizers. "The time is not distant," says the illustrious Liebig, "when our fields shall be fertilized with different salts, in place of being with manures always so insufficient, and which contain many useless principles often contrary to the vegetation of certain plants. Yet, with salts prepared in chemical manufactories they will manure the fields, and that with as much certainty as now in medicine the iodine cures the goitre, and that a few grains of quinine, replace efficaciously in curing fever several ounces of the coarse powder of cinchona."

The Sugar-cane has not yet we believe been examined in reference to the applicability of these modern agricultural ameliorations, and it is to this plant especially that we now desire to make an application of the principles. It shall be our object to endeavour to point out the peculiar fitness of special or concentrated manures to the culture of the cane, and to the position of the Sugar Planter. In order then to approach the subject we propose to ourselves, it becomes necessary for us to offer as briefly as possible a sketch of the mode of action of manures in general. A proper intelligence of this subject obliges us to enter on some details sufficiently abstract, and so little attractive, that we feel beforehand the necessity of requesting the indulgence of the reader, begging him to take the trouble of following us through a few very dry pages. Before going further then, we shall state briefly some general and elementary ideas on the principles of manures, their action and value as fertilizers. Ideas submitted solely to those who may not have been able to follow for themselves the important labours of Liebig, Bonssingault, Sprengel, Johnson, &c. &c. in these matters,

and assure themselves at the source of the impulse which European agriculture has already received, and to which colonial agriculture can no longer remain a stranger.

The elements of animals and plants are the same, the former obtain, through the latter principally, all the various constituents of which they are made up.

These elements (our province here is with plants only, and to them we confine ourselves,) however varied, however innumerable they may be in form, qualities, color, in which they may present themselves to us, are but about sixteen in number; of these, four are obtained from the atmosphere and water, and from the organic portion; and twelve from the soil, called the inorganic elements.

The organic elements then consist of carbon, oxygen, hydrogen and nitrogen.

The inorganic are silex, lime, magnesia, potash, soda, iron, manganese, phosphorus, sulphur, chlorine, and fluorine, (we omit iodine and bromine of marine plants.)

The experience acquired every day serving more and more to confirm the views and discoveries of Liebig in agricultural science, we confine our remarks in this sketch to the principles which he has laid down, leaving aside, for the present, those questions which are still at issue amongst scientific agriculturists. His doctrine of the uses of the phosphates and of the alkalies in plants may be sketched in a few words. The phosphates appear to be indispensable to the formation of all nutritious plants and seeds, and for the wisest purposes seem placed there, not only to supply the bony framework of animals, but as a constituent element of almost every part of their bodies. The alkalies act by fixing the carbonic acid of the atmosphere, which along with the elements of water under the combined influence of the vital force of the plant, and the chemical agency of the alkali, pass first into organic acids, such as the malic, citric, tartaric, &c. acids, and finally

into sugar, gum, starch or woody fibre ; all substances having the same essential composition.

The atmosphere principally supplies plants with carbon. Water furnishes the elements of hydrogen and oxygen. The nitrogen (according to Liebig) is obtained by plants from ammonia, diffused in the atmosphere, the vast recipient for all the nitrogen arising from extinct generations of plants and animals. The dews and rains convey to the soil the nitrogen of plants under the form of bicarbonate of ammonia. Liebig demonstrates by the most scientific calculations that the rains bring to the earth in the space of four months, (the European season or time supposed necessary for the maturation of the greater number of crops) about 112 pounds of nitrogen per acre ; a sufficient quantity to supply with that element, the fields, forests and all wild vegetation. These calculations, although made in Germany, may serve as approximate data for our guidance.

Plants absorb from the atmosphere, principally by means of their leaves, the important element of sugar, as likewise cotton, gum, starch, woody-fibre, &c. No known chemical agents possess such powers of composition and decomposition as the vital force of plants. This power decomposes the carbonic acid of the atmosphere, fixing its carbon for the various vegetable products above noticed. It decomposes water, retaining its hydrogen for the formation of oils, resins, wax, essences, &c. &c. Under its influence the decomposition and absorption of manure placed in the soil is hastened. What the nature of this vital force may be, we know nothing, and perhaps never will. Experiments demonstrate that, as in animal existence, electric currents circulate, and exercise a marked influence,—all else is mystery.

The atmosphere then contains all the elements essential to the formation of the organic elements of vegetables, in carbonic acid, in rains and dews, ammonia and sulphuretted

hydrogen,—substances which are also the ultimate result of the decay and decomposition of every thing which has had an existence, either vegetable or animal. Thus, the death and dissolution of one race becomes the source of life and health to a succeeding generation.

Beside the organic principles to which we have above alluded as drawn from the atmosphere, plants contain small quantities of earthy and mineral matters or salts, termed the inorganic elements; these we have stated to be twelve in number, and composed of acids, alkalies and metallic oxides. These inorganic salts vary in number, quantity, and quality, with the different varieties of plants. Experience has demonstrated that these are as indispensable to vegetable growth and existence, and take as active a part in the nutrition of plants as the elements borrowed from the atmosphere; that they are the proper food of plants, and that, through their aid, we may in fact be said to feed and fatten plants as we would animals. This is important to be borne in mind in reference to the views to which we wish to call attention as regards the culture of the sugar-cane. They should exist either naturally in the soil, or be furnished to it artificially by means of manures, so that each plant may find in it the salts which are necessary to its organization.

The analyses of each variety of plant leads us to a knowledge of the salts it requires from the soil, and an analysis of the soil itself, permits us to discover what elements are deficient, and which manures are called on to furnish. Upon an exact knowledge of these facts is built up the whole system of rational agriculture.

The exhaustion of soils arises from the absorption of these essential salts by the crops, and not from the disappearance of its humus or carbonaceous matter, as had been supposed until the important discoveries of Liebig. He first pointed out that carbonaceous matter, whether the result of anterior vegetation, or arising from the decay of manures, was but of

secondary importance as compared with the influence exercised by the inorganic elements usually contained in these substances ; that in fact the application of these latter matters, deprived of the usually accompanying masses of carbonaceous matter, exercised an equally beneficial influence on vegetable life. The important experiments of Wiegman and Polstorf have completely established the correctness of these views, and in these principles may be traced the whole theory of the utility and success of the modern concentrated manures.

It is important that clear ideas be established of the secondary value of the vegetable or carbonaceous matters of manures, in order to the full comprehension of the principle of essential salt fertilizers.

In illustration of these ideas as to the secondary importance of carbonaceous matter in the soil, we will give the words of Liebig himself. He says* (we quote from the French edition), "A question arises here, that is, to learn from whence the grass of the field, the oak of the forest, receive their carbon, since that *element is not conveyed to them by manures* ; and whence arises it, that far from becoming impoverished, these soils become richer every year in this element ! A certain portion of carbon is withdrawn annually in the form of timber and of hay, and notwithstanding that, the quantity of carbon augments in the soil ; and it becomes richer in humus ? Certainly no one can contest the beneficial influence which manures exert on the development of plants submitted to its action ; but *it is positive that the manure does not concur in the production of the carbon of the plants, and that it exercises no direct action on it* ; for as we have demonstrated by facts, the quantity of carbon which results from manured land is not greater than that yielded by those which do not receive this substance. From all we

* *Chimie organique appliquée à la Physiologie végétal.* Par Justus Liebig.

“know, humus is a product of the putrefaction or slow
 “combustion of plants or of vegetable matter. There cannot
 “therefore have existed a primitive humus, for before ‘the
 “humus there must have been plants. . . . They deceive
 “themselves singularly,” continues Liebig, “in attributing
 “to the disappearance of the humus of the soil that which is
 “properly the consequence of the withdrawal of its salts.

“The soil in the neighbourhood of Vesuvius, formed from
 “the disintegration of volcanic lava, may be considered as
 “the type of fertile soils; its igneous origin does not admit
 “of its containing the least trace of vegetable matter, and
 “nevertheless it is well known, that when these volcanic
 “cinders have been exposed for some time to the influence
 “of air and humidity, a soil is formed in which plants attain
 “the highest point of luxuriance. We must attribute this
 “extraordinary fertility to the presence of the alkalies con-
 “tained in the lava, and which by this disintegration of the
 “rock become gradually assimilable.

“In order that a soil be propitious to a plant, it is neces-
 “sary that the latter should find all the inorganic principles
 “or salts necessary to its development in sufficient quanti-
 “ty, and in a proper state for assimilation. All plants
 “require alkalies, some in the form of silicates, others in the
 “state of tartrates, citrates, acetates, oxalates, &c. &c. A
 “third species requires phosphate of lime, another phosphate
 “of magnesia, and others definitively do not prosper without
 “carbonate of lime. The vegetable matters which are con-
 “veyed to the soil by means of manure, exert, it is true, a
 “certain influence on vegetation, and that because during
 “their rotting, they nourish the young plants with carbonic
 “acid. Nevertheless, in considering all circumstances, it will
 “be agreed that *the influences of the vegetable matter of or-*
 “*inary manure can hardly be of much importance*, and that
 “it is exclusively to the inorganic matter that it owes its ef-
 “ficacy. It may be therefore concluded from what precedes,

“that the dung of animals may be replaced by substances which contain the same principles.”

Now it being once conceded, that the great mass of vegetable or carbonaceous matter of ordinary manures, is of but little importance to the nutrition of growing plants, it will not be difficult to explain on what small portions of matter the true source of fertility depends, and thus in few words demonstrate the immense fertilizing powers exhibited by the application of comparatively homœopathic doses of artificial manures. On referring to a number of analyses of farm-yard manures given by Boussingault, we find that he gives 79 per cent. as the mean quantity of water contained in such matters, leaving 21 parts or pounds of dry vegetable matter and salts; that is, more than three-fourths of manure is simply water, of the remaining 21 pounds, about $7\frac{1}{2}$ are carbon, the element with which Liebig has shown plants can provide themselves from the atmosphere, as likewise with the oxygen and hydrogen, forming about $6\frac{3}{4}$ pounds of the remainder; leaving for nitrogen and inorganic salts but six parts or pounds. The latter in fact represent the whole of what we really convey of useful to the field in 100 parts or tons of manure, and again, of this a large part might be dispensed with as being in general an abundant constituent of the soil itself. Of the physical action of vegetable matter in opening the soil we shall speak hereafter, but even this action does not appear to be of the importance which was formerly attributed, more especially in soils of good natural constitution or rendered so by tillage.

We are so accustomed to treat of manures by the cart-load or in large masses, that the idea may be received with some degree of incredulity, that the same effects may be produced by small quantities of matter and with much less effort; that there may be shown some hesitation perhaps in adopting the method of fertilization to which we beg to call attention. Nevertheless, nothing is more correct than what we have

above stated, nothing more positive or incontestable than the results obtained in England on the subject. At the present day practice is altogether in harmony with theory. Ordinary stable manure or dung may be replaced by essential salts of facile application, of easy transport, requiring the smallest quantity of manual labour, and economical in outlay, all conditions having peculiar weight with the sugar-cane cultivator. The extent of surface to be manured will not in future arrest the efforts of the sugar planter. It will be no longer a question of a limited extent of plantations, confined by the quantity of manure he can scrape together, but a question of fertilizing the whole extent of cultivation, including not only new plantations but his ratoons of all ages, sustaining the powers of the soil in reference to the latter, so as to bring round in due season, not a great extent of scrubby diminutive canes, but a full grown productive crop, the result of the application of artificially prepared salts of ammonia, phosphates, and the alkalies.

This great improvement in the culture of the cane may be effected without augmentation in the number of labourers; without other means than those which the actual modes of plantership place at the disposal of the planter.

As a general principle it may be assumed, that in any branch of industry in which the natives of India can obtain by their simple processes, a maximum or nearly so, of produce, the prudent European should be very cautious of entering into a competition with them; for their small outlay in stock and personal expenditure, simple and ingenious methods, great economy, their highly intelligent and practical knowledge of all agricultural details suited to the nature of their soils and climate (knowledge too generally underrated) form together a mass of circumstances, which will inevitably give them advantages, with which the European farmer cannot compete, whenever it becomes a question of the most economical means of producing any given crop. The most

prudent proceeding is to enlist them on his side, or in fact establish the *ryotty system*. That system in short which forms the special attribute of Euro-Indian agriculture, and gives the Bengal planter advantages possessed by no other British colonist, the full value of which can be only felt by those who have witnessed the difficulties experienced by the old sugar colonies, expending their very hearts' blood, in the endeavor to supply themselves with the primary element of labour.

In connection then with a ryotty cane cultivation, we would beg to suggest and submit to the consideration of the planters of Bengal, the applicability of a system of advances of concentrated artificial manures to the native cultivators, as is now the practice in reference to indigo seed? The transport of such a substance could form no objection. Its application requires no special knowledge, or augmentation of labour, which is not altogether in accordance with the careful methods of the native cultivators; whilst augmented produce is in the interest of both parties. We beg the examination of this view of the subject to those interested.

The question of manures prevails over all others in agriculture. With their assistance every thing becomes possible. There are no more bad soils. The poorest cease to be ungrateful, provided always that they possess certain physical qualities of friability, depth, drainage, and without which no attempt at sugar culture should be made, and which are too obvious to be dwelt on here, in addressing practical men. We return again to the subject of the fertilizing principles of manures, in order to bring out as clearly as possible the good results which may be derived from the application of concentrated fertilizers by the European Sugar Planter.

The data furnished by European scientific agriculturists will aid us here in determining the approximate value of the fertilizing salts contained in colonial manure, in the absence of special analyses made in the country. According to

Boussingault, a normal farm yard manure, composed of the excrements of horses, cattle, pigs, &c., and of their litter impregnated with urine, contains about 78 per cent. water; 17.6 per cent. organic matter, including 4 per cent. nitrogen; and 4.4 per cent. inorganic salts.

It is to these latter substances, and the nitrogenous elements, as we have before stated, that its happy influence on vegetation is principally due. The inorganic elements are in 100 parts,

Phosphate of Lime,	9.6
Phosphate of Magnesia,	8.0
Per phosphate of Iron,	5.5
Lime combined with carbonic acid,	9.0
Lime combined with sulphuric acid,	3.1
Potash combined with sulphuric and carbonic acids,	18
Silicic acid,	63.0
	<hr/>
	100.0

Many circumstances of course tend to modify the nature and qualities of farm-yard manure. The food of the animals will influence its properties, for the larger the proportion of grain they receive, the greater will be the proportion of nitrogenous elements and useful salts in their excrements. The manures of Europe should be superior weight for weight to that of hot countries, in as much as the colder climate will occasion a greater consumption of the carbon of the food for the maintenance of the animal heat and respiration, and enrich proportionately their dejectures.

The absence of correct knowledge of the true principles of manure, had, until lately, enveloped its action in obscurity, and given rise to vague impressions that the act of digestion exerted some mysterious influence, and concurred powerfully in giving it its fertilizing qualities. It was hardly suspected that the fertilizing action due to the excrementitious

7: *Observations on the applicability of Artificial*

matters, in place of being the result of digestion, was due to nothing else than the salts already contained in the food of the animal. It was little suspected that the same grain and fodder, if conveyed to the field without previous digestion, would occasion even greater fertility. Common dung is richer in salts and nitrogen than an *equal weight* of the vegetable matter which produced it, in this, that the animal has expended a considerable portion of the carbon of the food to sustain its animal heat and respiration. The residue contains nearly all the inorganic salts and nitrogenous matters. This will appear clear from the following approximate calculation. Suppose a horse to consume 40 lbs. of grass, (green) and 8 lbs. of grain per day; these substances will contain approximately, viz. 40 lb. grass contain lbs. 4 7 oz. carbon & 1 $\frac{3}{4}$ oz. nitrogen

8	,,	gram	,,	3	5	ditto,	2	idem
				7	12	carbon	3 $\frac{3}{4}$	nitrogen, to

which add about one pound phosphates and inorganic salts. The animal would consume, in order to sustain the respiratory functions, from 2 $\frac{1}{2}$ to 3 $\frac{3}{4}$ lbs. carbon per day, varying according to the labor which may be imposed upon him, and the atmospheric temperature. In taking a mean term for moderate labor we have a daily consumption of 3 $\frac{1}{2}$ lbs. carbon. The food given to the animal contained 7 $\frac{3}{4}$ lbs. carbon with 3 $\frac{3}{4}$ ounces nitrogen, and one pound of phosphates and inorganic salts. In the excrementitious matters, it will be observed, (having deducted the 3 $\frac{1}{2}$ lbs. carbon) there remain but 4 $\frac{1}{2}$ lbs. carbon against nearly all the nitrogen and inorganic salts, in admitting that the waste and repair nearly balance each other. It is therefore manifest that the manure will be richer in salts than an *equal weight* of the food which furnished it, although in reality poorer than the original food in fertilizing matter, in as much as there is always loss of nitrogen and salts in the perspiration, &c. &c.

In order to render more evident our ideas with reference to the advantages which the soil derives from a manur-

ing, we will reduce into figures the elementary composition of 20 tons of manure, supposed to be applied to one acre of land, and calculated after the analyses we have selected, viz :—

20 Tons of manure equal,	.. .. lbs.	44,800
Water, at 78 per cent.,	.. .. „	34,944
Animal and organic matter exclusive of nitrogen at 17-2 per cent.,	.. .. „	7,705
Nitrogen,	.. .. „	179
Inorganic Salts, Phosphates and Alkali,	„	1,972
Total, lbs.		44,800

The modern discoveries to which we have just begged the attention of the reader, authorize us to state with confidence, that in the 44,800 pounds of manure just submitted to his appreciation, there is not in reality more than 2,150 lbs. of essentially useful matters in salts and nitrogen; and again of these same elements, soils in general contain naturally in superabundance, some one or more, any addition of them being quite superfluous. It is of little importance under what form plants receive these elements, provided that by one means or other this amount of essential food is placed within reach of the vegetable digestion.

Thus it will be easily conceived that we might have dispensed with the labor and transport attendant on about 42,000 pounds of the original 44,800 pounds of manure applied !

Having now sketched, as briefly as possible, the principles of manures, and shewn that the same fertilizing effects may be produced by the application of comparatively minute quantities of salts, we shall now return to the consideration of the plant which occupies us—the sugar-cane; and endeavour to show the fitness of compound concentrated manures to its culture. In doing so, we shall have to offer some remarks on the speciality of the cane itself.

The sugar-cane borrows from the atmosphere and water the greater part of its elements. The admirable experiments of M. Peligot, and other chemists, have demonstrated that

this plant, as generally found in the West Indies, and we may add in Mauritius, contains about three-fourths its weight of water; its composition is according to him,

Water,	72·1
Sugar,	18·0
Woody fibre and Inorganic salts,.. ..	9·9
	<hr/>
	100·0

The precious salt of the cane, the sugar itself, is an atmospheric production, and is composed in 100 parts, of 41 parts of carbon and the elements of 59 parts of water. As to the portion to which it is indebted to the soil, (although equally essential to its prosperity, as the atmospheric elements,) it is but very minute, and may be stated at from 1 to 1½ per cent. of the weight of the cane, in mineral and earthy salts. These salts differ in quantity and quality in the different parts of the same cane. The juice contains according to the same author in lbs. 1,000, viz:—

Sugar,	lbs. 209·0
Water,	„ 771·7
Mineral salts,	„ 17·0
Organic matter,	„ 2·3
	<hr/>
	„ 1000·0

The inorganic elements of the Otaheite cane, according to careful analyses made in Mauritius, after the methods laid down by Will and Fresenius of the Grissen laboratory, are as follow:—

Silica,	47·75
Soluble matters,	32·35
Phosphate of peroxyde of iron,	4·45
Phosphate of Lime and Magnesia,	3·95
Carbonate of Lime,	4·10
Magnesia,	3·90
Carbonaceous matter and loss,	3·50
	<hr/>
	100·0

The Soluble matter contained

Sulphuric acid combined principally with							
Potash,	..	..	..	..	..	..	8.40
Carbonic acid combined with Potash and							
Soda,	..	..	...	..	..	..	1.10
Phosphoric acid combined with Potash,	..						0.85
Chlorine in combination with Soda as com-							
mon salt,	..	..	..	..	..	..	4.00
Gelatinous Silica in combination with Potash,							
Potash, ..	..	..	..	..	..	..	10.05
Soda,	..	..	..	..	..	..	2.65
Loss,	...	..	..	..	..	..	2.40

parts, 32.00

It is to be remarked in reference to cane analysis, that in no two canes were the same quantities of elements found. In some, the quantity of magnesia exceeded the lime, in others, the quantity of silica amounted to 65 per cent. The different parts of the same cane afforded variable elements. Young canes were found to be particularly rich in soluble salts, canes on new lands contained much more soluble inorganic elements than those produced on old lands. The beautiful law of substitution in vegetable nutrition first pointed out by Liebig, was constantly to be remarked in these researches. Canes from the known best estates in Mauritius constantly gave large proportions of silica, and less soluble and deliquescent salts than those from inferior soils. The analysis of the canes of Bengal remains still to be made, and merits every attention. In all cases the proportion of nitrogen is remarkably small for so large a plant.

If the reader will have taken the trouble to fix his attention for one moment on the above analysis, he will not have failed to remark, that this plant requires not only one or two, but several inorganic elements from the soil; and when it is borne in mind that plants do not come to perfection, if even

one of their elements be absent, it will be at once perceived that the administration of any single substance, however excellent in itself as a fertilizer, can never be depended on in practical agriculture. To this fact may be attributed the occasional failures recorded with even the best fertilizers. There is but one principle on which we can depend in composing special manures, and that is to combine them so as to offer every constituent which the nature of the plant of which you desire the prosperity, may require from the soil. "Many conditions are necessary for the life of plants," says Liebig, "those of each genus require special conditions, and should but one of these be wanting, although the rest be supplied, the plants will not be brought to maturity." In this point of view the planter has not to occupy himself with details of analyses of his soils, however useful and recommendable such examinations may be.

The sugar-cane differs in many respects from all plants in ordinary cultivation, and can hardly be compared with any of them; it is cultivated for its *stem*, and not for its seed. To give the greatest possible development to the former is the principal object of the agriculturist, and the quantity of manure which may be applied with profit in its culture, involves a question which has not yet been resolved. Too great luxuriance in the stem or straw of the cereals is known to be prejudicial to the produce in seed, too much manure may be given to them. Whilst the principal object of the farmer in Europe is the fixation of nitrogen for the food of man and animals, the fixation of carbon becomes the principal care of the sugar planter. The latter object is best fulfilled by alkaline manures. The quantity of sugar in the cane admits of augmentation by the methods of manuring employed. This fact may be verified by any one who will take the trouble, (in lower Bengal particularly) of comparing the juice of canes grown on good stable manure, and that grown on the same field, without manure.

This noble grass, the sugar cane, when placed in favorable circumstances, that is in a soil rich in its proper salts, and containing sufficient humidity, exists several years, yielding annually its precious crop. These conditions may be produced artificially by irrigation and manures. In Mauritius, cane fields may be seen which have endured 16 to 20 years. The sugar cane is susceptible of acquiring a length of 15 to 20 feet.

A cane may be seen in the museum of Monsieur Geneve at Mauritius, measuring 21 french feet in length. The sugar cane is capable of yielding five, six and upwards tons of sugar in one crop and on an acre of surface, exclusively of after crops. In all cases of these extraordinary products, the presence of large quantities of fertilizing salts existed in the soil either naturally or artificially, as in the case of new lands loaded with the vegetable debris of ages. In one instance we find a notice of extraordinary produce from a field of canes which had been flooded during a hurricane, and the debris and humus of a neighboring forest strewn over the field.* Large produce was obtained in one instance from the application of 120 cart loads manure per acre aided by constant irrigation.† In this case the first crop was six tons per acre, the second crop two and a half tons, the third crop one ton, the soil in this instance was considered of very ordinary quality, and in a district not remarkable for its fertility. We have heard of eight tons of sugar per acre, but the above instances we have selected from well authenticated sources.

These instances are given in illustration of the immense productive powers of this plant when placed in favorable circumstances. The soils of Bengal are inferior in staple and quality to those of Mauritius, besides having been much longer under cultivation, larger quantities of fertilizing matter would be requisite to produce a given effect in the former than in

* Mr. Geneve at Black River, Mauritius.

† Captain Lesage, Moka, idem

the latter; in return, such matters are procurable much cheaper in Bengal than in Mauritius.

This power of augmented production when placed in favorable circumstances possessed by the cane, has not yet received the attention which it deserves on the part of sugar planters, who have too often preferred an extended surface of sorry, scrubby plantations, to a limited extent of highly cultivated and productive canes. It is our object to call attention here to the possibility of effecting this great improvement, by employing, when the stables cease to furnish their supplies, artificial salts specially compounded in reference to the plant we desire to cultivate.

In reviewing the nature of the sugar cane, and the faculty which it possesses of producing during a series of years; the rational method for its culture would be, to furnish *annually to the soil* a portion of nutritious salts, equivalent to that which we remove in the crops. Under this treatment soils would be inexhaustible. By these means it is possible to maintain the same plantations, if not in perpetuity, at least during several years, and thus effect a most important economy in labor, consequently in the price of production, and eventually enable the European planter in Bengal to produce his cane as cheaply, in all probability, as the native cultivator. Aided by irrigation in the dry districts of Bengal, this great improvement presents no practical difficulty. In the humid districts of the country the salts alone would effect the purpose. This practicability of sustaining the same plantations by the periodical restoration of the fertilizing principles of soils, forms one of the leading points to which we beg to call the attention of planters, as being calculated to effect the most important influence on the cost of production of the staple in question. On this occasion, and in support of our views, we may cite the opinions of the illustrious Liebig, who says, "we may maintain the fertility of soils in the same state, by compensating every year the loss

“ which we occasion them ; but it is only in giving more than
 “ we take away that it is possible to augment the fertility of
 “ the soil, and in consequence the produce of the plants cul-
 “ tivated on it.”

It will be borne in mind, that in endeavouring to point out the suitability and advantages which artificial manures promise to the cultivator of the sugar-cane, that we do not come to announce any new invention ; but solely to propose the application, in colonial practice, of some ameliorations the happy effects of which, in European agriculture, it is impossible to deny, in the increased crops and in the general aggrandisement of private fortunes. And when the cane planter reflects for one moment that every augmentation of his produce, over and above his ordinary charges of production, may be looked on as clear profit, he will at once admit that the subject of special manures is one which merits his most serious examination. We do not fear to repeat that modern science, in unveiling the true action of ordinary manures, and in indicating that these substances may be replaced and the same fertility produced by the employment of comparatively homœopathic quantities of matters containing the same essential principles, has thus, in rendering the most important service to agriculture in general, opened out resources more especially applicable to colonial property.

When the planter recollects that any means which would enable him to obtain from an acre of canes an augmentation of only half a ton of sugar, would admit of the profitable investment of at least £6 in manures, he will at once admit the importance of special manures, which may be obtained and employed at an expense of a few shillings. Here is the estimate.

10 Cwt. of sugar at 24s...	..	£12	0	0
Deduct for charge of manufacture				
one-third the value of produce,		£4	0	0
Balance in favor of manure,		£8	0	0

The inference to be drawn from this simple calculation we leave to the appreciation of our readers.

We shall now endeavor to show that the position of the sugar planter demands more imperiously the aid of artificial manures than that of any other agriculturist.

The economy of manures forms the very essence of improved European agriculture. To carry out his views the agriculturist has recourse to rotations, in which he employs plants which require, either different elements from the soil, or in less quantity. Plants are classed under three heads, according to the leading inorganic elements they demand from the soil, viz. potash plants, lime plants, and silica plants. Thus one plant absorbs from the manure those elements which another can dispense with, leaving to the profit of a succeeding race those constituents of the manure which it did not require in its organism. Rotations consist in fact in cultivating one or other of the above classes of plants with more or less skill and combination, all tending to produce the greatest quantity with the smallest expenditure of manure. When it is desired to obtain successively the same crops from the same field, recourse must be had to special manures combined so as to replace the same elements as have been removed in the preceding crop. Wheat has thus been made to succeed wheat—a problem hitherto unresolved. The position of the sugar planter is in the same category.

It is admitted as a principle in European farming that the number of animals to be maintained should be in ratio to the extent of land to be cultivated, and so that a sufficient quantity of manure should be produced to admit of fertilizing the same fields with a certain proportion, say 20 tons, every three or four years, according to the rotation adopted. Now let us examine for a moment the ordinary position of the sugar planter. In reviewing his operations, we observe an absence of all those combinations which tend to the production of manure and to eventual economy in its employ.

He cultivates a hungry silica plant, requiring either new lands, naturally very rich in salts, or the aid of large doses of manure. He cultivates but *one* plant, and demands consequently, the same elements continuously from the soil.

If we suppose a sugar estate cutting annually 600 acres of cane to make 500 tons of sugar; such a property would not, under the usual circumstances of management, possess a greater number of cattle than what would be strictly necessary for the purposes of transport, (for we do not suppose the existence of the inefficient cattle mill on such a property;) the manure of these animals would not be adequate to the effective manuring of more than 30 or 40 acres, *i. e.* for about *one-seventeenth part* of the plantation, or a manuring every seventeen years! Such a system of culture, applied to a gigantic grass, susceptible as we have stated of yielding a hundred tons of vegetable matter from one acre, and in one year, is entirely erroneous, and can only lead to the complete exhaustion of the soil, and the eventual decadence of the whole property,—decay, arrested only by the different circumstances of depth or natural fertility of the soil. And if, in spite of the lassitude and impoverishment of the soil, it is again tormented in successive years with the same crop, it can only yield the most wretched harvest, extorted at the expense of great efforts and outlay in labour.

It will appear evident that in the ordinary routine of plantership, recourse cannot be had with profit to rotations of crops. That the education of animals is incompatible with the march of a sugar factory. That sufficiently extensive accumulations of ordinary manure and its periodical distribution, involve almost impracticable details. That the soil, in most cases, limited in extent, and called upon incessantly to produce like a machine—always sugar. It will be evident we repeat, that artificial manures can alone fulfil the conditions required by the cane planter. Bengal more

than other countries, it will be found, possesses abundant resources for their combination. All the elements of Guano, ammoniacal salts, phosphates, silicates and alkalies are ready to our hand, independently of foreign importation, on terms which, on the contrary, would admit of supplying the wants of less favored countries. It is necessary that some one should occupy themselves in their proper combination.

We possess no data whatever to guide us in an enquiry as to the probable profit which might be expected to arise from the application of manures to the culture of the Otaheite sugar-cane in Bengal. In the absence of such information, we may with advantage refer to estimates made in Mauritius. Different soils and climates will necessarily modify results, and we must leave it to the intelligent reader to make his own application of the calculations to which we wish to call his attention. In England, the price of farm-yard manure may be taken at from six to ten shillings per ton, exclusive of the charges of transport and application on the field, and the farmer is satisfied if the capital employed in manures, whether from the farm, or artificial sources, such as alkalies, ammoniacal salts, guano, &c. &c., returns 10 per cent. interest on the outlay. It will be found that the sugar culture offers an immeasurably superior field for the profitable application of capital under this head.

It has been calculated that in Mauritius, an acre of land of medium quality, still capable of producing a crop of sugar cane, although partially exhausted by previous crops of the same plant, will produce, *without manure*

viz. 2,000 lbs. (French) of sugar in 1st crop.				
1,000	„	„	„	2nd „
500	„	„	„	3rd „
<hr/>				

Total, 3,500 French pounds of sugar in 4 years.

* We refer throughout these pages to the Otaheite, or Mauritius variety of cane.

A similar acre of land, aided by twenty to twenty-five tons of stable manure, would produce

viz. 3,500 lbs. (French) of sugar in 1st crop.

1,750	„	„	„	2nd	„
875	„	„	„	3rd	„

Total, 6,125 lbs. sugar in 3 crops and 4 years.

Difference due to the influence of manure is 2,625 French pounds of sugar. The value of which, at 24 shillings per 100 lbs. French, is £31 10s. Deduct one-third for the charge of manufacture, .. 10 10s. leaving £21 to the planter for outlay and profit on the manuring. This is without irrigation, which is rarely employed in Mauritius, but which would enormously increase produce could recourse be had to it.

Making full allowance for the superiority of the volcanic soils of Mauritius over those of Bengal, and greater fitness of the climate of that Island to the sugar-cane, it is probable that the following economic calculation might be made for the middle provinces of Bengal; moreover, we leave it to those who may be better informed, or who may be in possession of special documents, to rectify for themselves the base which we have assumed. We merely desire to arrest attention, and seek investigation as to the improvement which may be effected in cane cultivation by manures. One acre of land* of good quality, and taken after a suitable native crop of a non-silica plant, cultivated with the Mauritius or Otaheite variety of cane, irrigated, but unaided by manure, would probably produce 1,400 pounds of fair brown sugar in one crop and in one year. The same soil and surface aided by from twenty to twenty-five tons of mixed bullock and other manure, or its equivalent in artificial manure, say 8½ cwt., and likewise irrigated, should yield, viz :—

* Throughout this pamphlet we have preferred employing English weights and measures to the variable Indian maund and beegah, for obvious reasons.

In first crop, muscovado sugar 3,200 lbs. and about one-fourth of this amount, or 800 lbs. in a second crop ; which supposes that in consequence of the energy given to vegetation by constant irrigation, nearly the whole useful effects of the manure are expended in the first crop, and that no fertilizing salts have been added after the removal of the crop-process we have recommended as being the proper method of cultivating this plant.

Total produce in two crops and two years is 4,000 lbs. We have therefore an augmentation of produce, as compared with unmanured land, of 2,600 lbs. of sugar, due to the fertilizing influence of the manure, and representing at 24 shillings per cwt. £27 17 0
From which deduct $\frac{1}{3}$ for charge of manufacture, 9 5 8

leaving £18 11 4

for profit and employ of capital in manuring.

In reference to natural manures, it is of course understood, that it is not a question here of proposing to supplant them by artificial compounds, quite the contrary, every effort should be made consistent with economy to augment their production by every possible means ; their fertilizing effects may be considerably enhanced by the addition of concentrated fertilizers and the consumption thus economised. The benefits of artificial manures will be principally called into action after the store of ordinary manure is exhausted ; with the advantage, that from their portability they may be applied to the whole extent of plantations immediately after a crop, so as to re-fertilize every impoverished field.

But even if the necessary quantity of stable manure could be procured *gratis* for such an extended application as is above supposed, it would cost an estate more to cast it on to the land and apply it in the cane holes, than would the whole cost and charges of application of a concentrated fertilizer. Moreover, the application of ordinary bulky manures to the

extent of 4 or 500 acres of plantation is a totally impracticable manœuvre. If we assume the cost of artificial manure at 30 rupees per ton at Calcutta, and actually delivered on the sugar estate at 40 rupees, the cost of $8\frac{1}{2}$ hundred weights, (the quantity equivalent to 25 tons of farm-yard manure,) the expense would be 17 Rs. or £1. 14s. which we have to deduct from the £18. 11s. 4d. the sum above found as the approximate benefit accruing from a certain quantity of manure applied to the sugar-cane, representing an amount of profit which no other amelioration yet brought under the notice of the planter is calculated to realize. We have not carried into account the expense of application, for the reason that, unlike bulky manures, it requires no additional labourers or transport animals to those in ordinary employ; that canes sustained in rich vegetation require practically less weeding, &c. &c. It is not unimportant to remark in this place, that soils rich in fertilizing principles, and therefore in a state to produce a healthy and vigorous vegetation, are not infested with destructive insects. The moment soils become exhausted or deficient in any one element necessary to the existence of the cane, from that instant the borer grub commences his ravages, and poor, unprofitable canes are alone produced. Insects are an effect, and not a cause. The application of a small quantity of a powerful fertilizing salt, such as guano, or sulphate of ammonia, &c. around the roots of an infested cane hole, in giving greater vigor to the vegetation, at the same time drives away the pest. An experiment made by us, in reference to white ants, also leads to the belief that this pest will not touch canes manured with concentrated salts. In a piece of ground infested with white ants, the cane plants on ordinary stable manure were devoured immediately. In the holes in which the salts were employed, the canes vegetated and were saved.

Mauritius cultivates about 80,000 acres of cane, of which 60,000 acres are cut to make a crop of 40,000 tons of sugar one

year with another. Now it has been estimated, in calculations made referring to the influence of concentrated manures on the agriculture of that colony, that, if by any means it were made practicable to produce only *one single cane more* per cane hole, than there actually exists, that this simple amelioration would effect an augmentation of more than 20,000 tons of sugar in the annual crop; that is, an improvement of about 50 per cent. in the produce and resources of the colony, taking the annual produce at 40,000 tons.

Here is the proof: 60,000 arpents or acres of plantations, each acre containing 3,500 cane holes, give 210 millions of cane holes, and consequently an equal number of canes; these canes, at the moderate calculation of three pounds weight each, would produce at the rate of 15 cwt. of canes to the cwt. of sugar, 21,000 in place of 20,000 tons as we have stated. But the amelioration practicable by artificial manuring, is capable of effecting a much greater agricultural revolution than what we have above supposed, from its tendency and influence in economising the price of production.

If the reader will for a moment but make the application of such a calculation to Bengal, he cannot fail of being struck at the magnitude of the prospect which that country opens. It would not perhaps require more than one-fourth of the surface of land actually employed by indigo in Bengal, to supply the present consumption of sugar in England. Happily the field is not likely to be limited. The disposition evinced in England, and in fact in Europe, to untrammel the commerce in sugar, opens an almost boundless field for competitors.

The fertilizing effects of twenty tons of farm manure as applied to the sugar-cane, may be produced by eight hundred weight of compound salts made special to the plant in question. If it be desired to apply 40 or 60 tons, that is, give a double or triple manuring, it will be necessary to augment artificial fertilization in the same proportion. Ex-

periments should be made even on the smallest scale on native cane fields, by those who may not have plantations of their own, to be assured on one of the points on which we have endeavored to fix attention, that is, the practicability of enhancing the value and produce of Ryotty cane cultivation to mutual advantage. To indigo planters, already surrounded with native cane cultivators, we believe these views are calculated to open a new and most important field of operations.

The humid districts of Bengal present advantages for the culture of this essentially water-loving plant, which perhaps have not been sufficiently appreciated. Attention seems to have been more generally directed to the sugar culture in the drier districts of Bengal than elsewhere. The inundated districts of the country, however, it should be recollected, present the same conditions, and all the advantages for the growth of the sugar-cane possessed by Demerara—the most productive of the British sugar colonies. By the employment of embankments as in the latter colony, the richest tracts of alluvial soil, (now under crops of rice) could be placed in the necessary condition for the sugar-cane: the periodical inundation being kept out or let in occasionally on portions to restore fertility. The annual fall of rain in lower Bengal is not so great as in Demerara.

The great facility with which a sufficiently extensive tract of such land might be procured within a ring fence, and with economy of outlay, are all circumstances which merit the attention of the sugar planter. Those elements of the soil which exist in the dry provinces, and which give them their present superiority, may be added artificially, and thus bring forth the full advantages of the humid climate.

The method of employing the artificial manure is so simple as hardly to require notice. Having determined the quantity of manure to be employed per acre, whether the

equivalent of 20, 40 or 60 tons, the labourer is to be furnished with a tin measure (or bamboo joint) containing about one quarter of a pound. This quantity, (supposing the acre of land to be holed at the rate of about 3,500 holes,) per cane hole will represent the equivalent in fertilizing power, of 20 to 25 tons of the ordinary dung heap per acre ; two measures, 40 to 50 tons, and so forth. The fertilizing salts should be carefully mixed up with 8 or 10 pounds of the soil itself, taken in or from around the cane hole. We assume here planting in holes, not in drills. Experience has proved the former to be superior to the latter. The hole forms a little reservoir, in which nutritious matters tend to deposit themselves. The drill, in heavy rains, becomes a canal lending itself to the washing out of the most valuable portions of the soil or manure. It is not our place here to enter on any of the practical details of plantership, our task alone is to call attention to the extent of aid which the planter may in reality derive from artificial manures. It is not indispensable to deposit the salt before planting, as cane plants contain sufficient elements within themselves to sustain the life of the young plants to a certain stage, when aided by humidity, either natural or by irrigation. The facility of application of a concentrated manure, moreover, is such, that it allows the planter to select the most favorable moment of the season, and so as not to lose by volatilization an atom of its efficacious principles, an inconvenience inseparable from ordinary farm-yard manure from its nature, mode of collection, and employ, sometimes in good and sometimes in the inert season.

An agricultural compound salt, such as we propose, will remain in store without injury until the favorable moment for its application arrives. We recommend the application of artificial manure with the first weeding and hoeing at the commencement of the rainy season, and when the young

plants have already acquired some development; and that the quantity of manure be applied at *twice or even thrice*, in preference to applying the whole dose in a first application, and at intervals of a month or six weeks according to the judgment of the planter, and his operations of weeding and stirring the soil around his plantation.

In reference to ratoon canes of different ages, the artificial fertilizer should be applied as soon after the removal of the crop as possible. The field being cleaned by burning off or otherwise, it should be deposited in the intervals of the cane ranks as it were broadcast, hoed into the soil, and irrigation employed (in the dry districts,) so as to dissolve and impregnate the soil and bring into immediate energy the fertilizing principles. An immediate crop will start forth with renewed vigor from the soil when such means are employed. The older the crop, and the more exhausted the soil, the larger the quantity of salts must necessarily be employed to produce a given effect. Let it always be borne in mind, that with the plant in question, cultivated for its stem, as we have stated, the quantity of produce bears a ratio to the quantity of nourishment afforded it. Experiments are requisite to decide to what extent manures may be profitably employed in the culture of this plant—a question, the examination of which is well worthy the attention of the Agricultural Society, and of individuals interested in resolving the important problem. We have already alluded to the immense produce, which this plant is susceptible of yielding when placed in presence of abundant nourishment. The atmosphere is ever present, and ready to furnish the greater part of the necessary constituents. It is the part of the cultivator to supply the element of water, where that is insufficient, and the minute portion demanded from the soil in order to complete the productive cycle.

We have now to call attention to the relative value of different Colonial crops, as showing in another point of view,

the peculiar fitness of artificial manures to the culture of the sugar-cane.

Value of the produce of one acre of Indigo,			
at the rate of 15 lbs. of Indigo per acre,			
and at 5 shillings per pound,	£3	15	0
Idem of one acre of cotton, at 1½ hundred			
weight per acre, and at 4 pence per pound,	2	16	0
Idem of one acre of coffee, at 2 hundred			
weight per acre, and at 42s. per cwt., ..	4	4	0
Idem of one acre of sugar-cane at 1½ ton			
sugar per acre, and at 24s. per cwt. ..	£36	0	0

The above estimates will serve to show, that the sugar-cane can support an expence in manuring, which perhaps no other plant, except coffee, could bear. The latter plant, coffee, we are aware, does admit of immense augmentation under the influence of fertilizers.

On the advantages which Bengal possesses as a sugar-producing country, we shall not here attempt to dwell. Recent events at home show the strong bias which exists to the admission of the staple in question on the most liberal commercial principles, a tendency which moreover we may expect to see extended every day, even to the destruction of some of the oldest and hitherto most cherished interests, to place this staple in fact in its proper position, not as a luxury, but as a valuable nutritious necessary of life, to be placed within the reach of the greatest possible number. Viewed in this light, the sugar commerce presents a vast field indeed, and on which we are as yet only on the threshold. The most favored country must be prepared for competition. The most effective remedy to meet this competition is, without doubt, production at the lowest possible price. To produce at a low price, the planter must be ready to avail himself of all the improvements which the daily progress of science lays open to him. The West India Colonies are now fully awake to the valuable

aids to be derived from the application of improved machinery in the manufacture, and of manures in the culture of their staple product ; to the latter department, we have dedicated these pages. To remain behind in this onward progress, is to abandon every thing. Before engaging in the improvements to be made through the aid of machinery, always involving a large outlay of fixed capital, the planter should enquire into the improvements to be made in agriculture, to diminish labor, and maintain at the same time the revenue on the same footing, by sustaining the fertility of his soils, and even augmenting their productive powers ; by counterbalancing, by increased produce, any diminution in the market value. These are the results to which the views we have endeavored to trace out are calculated to lead, by permitting the culture of the cane on the largest scale under the known fertilizing influence of manures ; by maintaining the plant several years on the same soil ; in augmenting the returns of each crop without a comparative augmentation in expenses ; in preventing the exhaustion of the soil, which the nature of the sugar culture tends unceasingly to occasion ; by permitting the planter to avail himself with redoubled advantages of that most powerful engine of cheap and extensive production, the special privilege of Bengal, a ryotty cultivation, promising the most favourable results to the European planter, and the aggrandizement of the industrious native farmer.

The application of the principles we have endeavoured to trace, presents in fine, one of those innovations destined to effect a revolution in the future management and value of sugar property, more than any amelioration, which we believe, as yet been offered to the consideration of the planter ; it is calculated to exercise an extensive, rapid, and efficacious influence on the economical production of the staple in question, and in enabling him to compete with advantage against a foreign competition in the metropolitan market.

Correspondence regarding the experimental Cotton cultivation in Rungpore, with a few remarks on the staple products of that District.

(Communicated by the Government of Bengal.)

To JAMES HUME, Esq., Secretary Agricultural Society.

SIR,—By direction of the Governor of Bengal, I have the No. 434 of 14 Nov. 1844, honor to forward, for the Society's use, with Enclosure No. 54 of 7th Feb. 1845, with Ditto. copy of two communications from the Secretary to the Sudder Board of Revenue, with enclosures, on the subject of cotton cultivation in the district of Rungpore. The specimens alluded to in Mr. Plowden's letters of the 14th November and 7th February last, are likewise transmitted.

I am, &c.

CECIL BEADON,

Under Secretary to the Govt. of Bengal.

Fort William, 12th March, 1845.

To F. J. HALLIDAY, Esq., Secretary to the Government of Bengal, Revenue Department.

SIR,—I am directed by the Sudder Board of Revenue to *Mis. Dept. Present* submit herewith, for the consideration *J. Pattle, }* and orders of the Right Honorable the *and* Esqs. Governor of Bengal, a letter in original, No. 206½, dated 10th ultimo, from the Commissioner of Moorshedabad, and the three specimens of cotton from Mr. Terry, the Government Planter in Rungpore, which accompanied it, together with an extract on the subject from the Commissioner's Operation Report for the past year 1843-1844, and a copy of Mr. Terry's Report therein referred to.

I have, &c.

(Signed)

GEORGE PLOWDEN,

Offg. Secretary.

Fort William, 14th November, 1844.

Extract, paragraph 7th of a letter from the Commissioner of Moorsshedabad, to the address of the Sudder Board of Revenue, No 206, dated 10th October 1844.

Para. 7th.—The only remaining operation now in progress is the experiment in cotton planting in zillah Rungpore under Mr. Terry. to the capability of the soil for cotton planting under Mr. Terry, an American ; the orders of Government limit very closely the actual experiment, but it appears to me impossible to arrive at any thing like a satisfactory result without more extensive experiments. No doubt the experience of Mr. Terry may enable him to form a guess as to the capability of the soil from inspection, but nothing approaching to satisfactory or conclusive information can be obtained without experiments of some extent. I intend visiting Rungpore shortly, when I shall be able to confer with Mr. Terry and the Collector on this subject. The reports hitherto received seem to show that Mr. Terry entertains a favourable opinion of the soil in some parts of the zillah ; the circumstance noted by the Government in a communication received from the Board that cotton is grown to a greater extent in Dinagepore than in Rungpore has been pointed out to him ; he states that the progress made by the plant he has already sown is satisfactory, and he seems sanguine as to the result. The Collector, Mr. Dick, is disposed to give every assistance in his power to carry out the object which the Government have in view ; and has even advanced money to this end on his own private responsibility. I annex a report very lately received from Mr. Terry ; he finds that the Mexico seed which has been distributed already in Rungpore by Mr. Bonnevillie has led the natives to prefer it to the indigenous cotton, and proposes that advances be made to the ryots to induce them to cultivate this seed ; the seed being also supplied to them. I think this will be found the best plan, and would advise that experiments be made in the localities chosen by

Mr. Terry, of not more than 100 biggahs in one spot, to such extent as the Board may approve; an arrangement may be easily made with ryotts, which will be more economical than a home cultivation, and the ryotts will further have the benefit of Mr. Terry's instruction in the management of it, while at the same time he may himself acquire a knowledge of the seasons and soils of the district in communication with them: by this means we shall obtain a sufficient supply of cotton, to enable us to judge of the propriety of carrying the experiment further, and Mr. Terry will be enabled to report more fully, and to speak with more confidence on the subject for the investigation of which he has been appointed. I send, in a separate package, three specimens of cotton, which Mr. Terry wishes to be laid before the Honorable the Governor; one of country cotton, grown at Mitapoker, another of cotton grown from Mexico seed at the same place, and a third grown in the Bhootan hills, coarse in fibre, but the bowls of which are the largest Mr. Terry has seen in any part of the world, shewing, in his opinion that the soil is well adapted for the plant, and that Mexican seed might be equally productive of a good cotton; it would be advisable that an experiment should be made on this soil

To A. Dick, Esq., Collector of Rungpore.

SIR,—In continuation of my letter, No. 20, of the 16th ultimo, I beg to inform you that I found the lands on the banks of the river Ghangut high, but not very rich, being mixed too much with white sand. The best places I saw on the stream was Ootun, Barregurree, and Bhetgurree; the soil at the above named villages is black clay, with a black sand very like the soils in the station of Rungpore. I see the natives grow in every village more or less of the perennial cotton, the plants are very large, and now full of bowls; the bowls are very small, though the wool is very fine; the ryotts grow this cotton about their houses and yards. I have seen

some plants 8 or 10 feet high, and propped up with bamboos to keep them from falling down. I beg to add, that in my travels I heard that there was a quantity of the annual cotton grown at Meetapooker about 14 miles from the station, and seven miles from the river; the soil there is black sand and clay. I had the pleasure to find it grown in abundance; the ryotts plant some with indigo, and of course the cotton has no chance until the indigo is cut off, and of course it cannot make much, though they plant some with chillies and ginger; and as they do not plant them so thick as indigo, the cotton has a better chance, and as they weed and keep the chillies and ginger clean, the cotton is much better. I saw some cotton in their chilly fields 6 or 7 feet high, and very full of bowls; the bowls on the annual plants are larger than the perennial kind, though the wool is coarser and shorter. I was unable to ascertain how much they reaped per beegah from Meetapoker. I went to a village called Muckerampore; here they also plant the annual to some extent; the soil is black clay and sand. I here found two or three ryotts growing the Mexican cotton from some seed that Mr. H. Bonnevie got up from the Agricultural Society several years ago,* and induced them to plant it, by reducing their rent two rupees; and now they have got it, they find it more profitable to them than the indigenous cotton of the country, as they acknowledge themselves. The field I saw was about half a beegah, the plants were three years old, and the ryot told me that he collected enough from it to clothe himself and family, five or six in number; and sold some in the market. I have forgotten to add, that his plants have a good lot of bowls on them, and he had collected a good deal of cotton from them this season; I also gave him some

* This seed was probably a portion of the supply brought out by the late Capt. Bayles, Supt. of Cotton Plantations. It was placed at the disposal of the Society by Government in March 1841, and distributed immediately over all parts of the country.—*Ed.*

seed in May last: he planted it late; the plants are small, yet they have some fruit on them. I beg to add that the ryots are all willing to plant the Mexican cotton, provided they get an advance for doing so; and I think if Government would give them a little encouragement, it would be the means of the Mexican cotton being spread through the country, as the ryots themselves acknowledge, who have cultivated it, that it yields a larger profit than the cotton of the country; should Government be pleased to advance the ryots to cultivate, I would wish it near the station of Rungpore, so that I can look after it, and see that the plants get justice done them.

I am, &c.

(Signed) F. J. TERRY,

Rungpore, Oct. 2nd, 1844.

Govt. Cotton Planter.

I have quite forgot to add, that I gave seeds to as many ryots as would receive them; they promised to plant them agreeable to my instructions, and I also gave Mr. Rehlling some seed at Bhetgurree, which he will plant immediately, and has promised to let me know how it turns out.

*From the Commissioner of Revenue, 14th Division, Rajshah-
hee, 10th October, 1844.*

To the Sudder Board of Revenue, Fort William.

GENTLEMEN,—I have the honor to forward in original three
No. 23, dated 2nd Oct. to the address of the Collector. letters from Mr. Terry, American cotton
No. 24, dated 2nd Oct. planter at Rungpore, which have been
No. 25, dated 2nd Oct. Do. received with three different specimens
 of cotton grown in Rungpore; I have referred to these specimens in my operation report of the 10th instant, No. 206.

I have the honor to be, &c.

(Signed) W. JACKSON, *Commissioner.*

No. 23.

To A. DICK, Esq., Collector of Rungpore.

SIR,—I beg to forward to you one bowl of cotton that I got in my travels, and beg the favour of your forwarding it to Government. This cotton was grown in the Botan Hills ; the wool is coarse and short, though the bowls are larger than any I have ever seen any where in the world. I think if a better seed was introduced, then a better cotton might be produced, and probably to great advantage.

I am, &c.

(Signed,) F. J. TERRY,

Rungpore, Oct. 2nd, 1844.

Govt. Cotton Planter.

No. 24.

To A. DICK, Esq., Collector of Rungpore.

SIR,—I beg to forward you a small sample of the annual cotton that I got out of a ryott's field at Meetapoker ; the wool is coarse and short, though the plants are of good size, when you take into consideration the manner in which it was cultivated.

I am, &c.

(Signed,) F. J. TERRY,

Govt. Cotton Planter.

Rungpore, Oct. 2nd, 1844.

No. 25.

To A. DICK, Esq., Collector of Rungpore.

SIR,—I beg to forward you a small sample of the Mexican cotton, grown by a ryot in the village of Muckrampore ; the plant that I got this from, was three years old.

I am, &c.

(Signed,) F. J. TERRY,

Rungpore, Oct. 2nd, 1844.

Govt. Cotton Planter.

To F. J. HALLIDAY, Esq., Secy. to the Government of Bengal, Revenue Department.

SIR,—In continuation of my letter, No. 434, of the 14th November last, I am directed by the *Mis. Dept. Present* J. Pattle, } Esqs. Sudder Board of Revenue to transmit and J. Lewis, } herewith, in original, for the consideration of the Right Honorable the Governor of Bengal, a report (No. 257, dated the 31st December,) from the Commissioner of Moorshedabad, together with its annexed copies of two letters from the Collector and Mr. Terry, respectively.

2. The Board observe with much gratification the interest taken by Mr. Jackson in the success of the cotton experiment in zillah Rungpore, and their thanks are due to him for the information he gives of the statistics of that district, as regards its production and the distribution of the produce; but they doubt whether it is derived from accurate sources, and can be fully depended on.

3. The Commissioner, it will be seen, proposes that small advances should be made to ryots of the district for the cultivation of cotton, in order to test the capabilities of the soil, and that the produce should be purchased from them, the re-sale of which he thinks would probably cover the whole outlay. The Board would recommend that the experiment be allowed, and they see no objection to its being conducted by the Collector, should ill health prevent Mr. Terry from superintending it.

4. The specimens of cotton, thread, and cloth referred to in the 5th paragraph of the Commissioner's letter, accompany.

I have the honor to be, &c.

(Signed,) GEORGE PLOWDEN,
Offg. Secretary.

Fort William, 7th Feb. 1845.

From the Commissioner of Revenue, 14th Division, Camp Bauleah, Zillah Rajshahee, the 31st December, 1844.

To the Sudder Board of Revenue, Fort William.

GENTLEMEN,—I have the honor to report, that in visiting Rungpore, from which place I have just returned, I took the opportunity of examining the state of the cotton cultivation under the American planter Mr. Terry, and of conversing with him and the Collector, Mr. Dick, upon the subject of extending the experiment. I found Mr. Terry just recovering from a severe attack of fever, and still in a weak state; he appears to be a keen, active-minded person, and willing to apply himself with energy to any practical experiment, but more adapted for making the experiment than for writing a detailed report on the result: he is now so far recovered as to be able to resume his journey through the country, and examination of the various soils in the district.

2. I found about 15 beegahs had been sown by Mr. Terry on various spots in the vicinity of the station: in most he has divided the patches, sowing part with the Bundelcund seed, and part with the Mexico; the Bundelcund plant grows higher, and more straggling; the Mexican plant is lower and more bushy, and produces, in Mr. Terry's opinion, more cotton; the quality of course is better and finer; I found at least half the pods, which I examined, had been attacked by an insect, and contained a caterpillar which destroyed the produce or rendered it unfit for use; the plants however looked well and thriving, and the produce was, in Mr. Terry's opinion, very fair in quantity and quality.

3. While at Meetapoker, about 14 miles south of Rungpore, I found that two ryotts in the vicinity had cultivated cotton from the Mexican seed, which had some years ago been given them by Mr. Bonnevie, one of the Government farmers, who had also reduced their rent to induce them to

buy it; about six cottahs were growing in Mokurrumpore and two or three cottahs in Gopalgunge. I talked for some time with Khodadel, an old ryott, who had the larger patch of this cotton; he shewed me some of the cotton, of the cotton thread, and a chudder or coarse cloth which had been made from this Mexican seed by himself; the chudder he had was worth about 12 annas, when a similar chudder from the native cotton was not worth above 8 annas, and I ascertained this to be the case; the thread too is stronger and more valuable; he did not grow the cotton as an annual, but let it stand on from year to year; that which he has, had been growing for eight years; it produces during about six out of the twelve months. As a proof that the produce is superior, his Mundal wished to raise his rate of rent by one-half, but this I took measures to prevent; he stated that the insect destroyed 10 out of 16 of the pods, and that it attacked the Mexican much more than the common country cotton; the land about Meetapooker is entirely the black low land; there is none of the keara or high light soil; which prevails, however, in Peergunge, about 12 miles off, and on the confines of Denagepore.

4. Mr. Terry agrees with this ryott in thinking, that clayey soil will not answer for the cotton so well, as it retains too much moisture; and although the land in which the experiment has been made about Rungpore is not clay, still it is of the black low kind, and I think it advisable that the experiment should be made in other distant parts of the district, particularly in the keara land, which is lighter and drier, though perhaps not so rich. I have therefore directed Mr. Dick, the Collector, to try ten or twelve beegahs in the Peergunge land, and that on the confines of Denagepore; also in some patches of land to the north of Rungpore, where the soil is also light; the most desirable, according to Mr. Terry, is a rich sandy soil. It is very plain, that no ocular inspection of the soil can give a satisfactory know-

ledge of its capabilities, which can only be tested by actual experiment; the best method is, by making a small advance to the ryott, as is done by the indigo planters, and purchasing the produce of him, insisting at the same time that the spot is to be given up entirely to the cotton, no other cultivation to be mixed with it, and the management of the field to be conducted according to Mr. Terry's plans, as far as possible. I have given directions to this effect to Mr. Dick. The sale of the cotton will probably cover the whole outlay, and it would be matter of regret to omit to test the capability of the Rungpore soil in an effectual manner, now that we have the advantage of Mr. Terry's practical knowledge to guide us.

5. I send a specimen of the cotton grown by the ryott at Meetapoker, of the thread made from it, and of the cloth, each of which the Board will observe is superior to the common country produce. I have no doubt the ryotts would willingly undertake the cultivation, on seed being supplied, and small advances made to them; the chief difficulty is the damage done by the insect. I have sent specimens of the damaged pods, containing the insect, to the Agricultural Society, and have requested the Secretary to endeavour to ascertain the natural history of the insect; and, if possible, to point out a remedy: it is evidently some fly, which deposits its eggs in the pod; these eggs become caterpillars, of a small brown description; perhaps it might be possible to keep the fly off by some application to the pod, or to time the sowing so as to bring the plant into pod at a season when the insect does not lay its eggs. Mr. Terry has sown his plant in May, which he thinks the best season; that sown in October will not, in his opinion, answer; but of this, I am not quite satisfied.

6. Mr. Terry thinks, that it would be desirable, if the cotton is hereafter cultivated extensively, to obtain seed direct from Mexico; the cotton known by the names of Up-

land Georgia, and New Orleans, is the produce of Mexican seed acclimated in those places; the seed is there renewed every five years in small quantities, which is grown at first on inferior land, merely for the sake of the seed; it does not bear cotton well for the first year or two, but when acclimated it is sown for produce; this circumstance should perhaps be held in mind, and the seed renewed in the same manner in India from time to time, otherwise it will no doubt deteriorate: unless obtained direct from Mexico, there can be no certainty whether it is actually fresh Mexico seed or not.

7. There is but little cotton at present grown in Rungpore; but the coarse Garrow cotton, as pecimen of which I sent the Board on the 10th October last, seems to thrive so well and to be so productive, that it would be worth while to give some of the Mexican seed to any one who would try the experiment with it, on the soil where the Garrow cotton is grown; if it will produce fine cotton in the same abundance as it does the coarse fibred material, the result would be highly satisfactory. I have directed the Collector of Rungpore to endeavor to effect this.

8. In making enquiries regarding the extent to which cotton is already cultivated in Rungpore, I learned that it is quite trifling, far from sufficient to supply the wants of the district itself, there is therefore no export of this article, but a considerable quantity is brought into Rungpore from Dacca, from Mirzapore, and some thousands of maunds from the Garrow Hills; there is no reason whatever why the cultivation should not be introduced; the natives have some superstitious objections to the introduction of any new species of cultivation, but this I apprehend would soon be got over if they found that it turned to their advantage; one or two would adopt it, and others would find it their interest to follow their example.

9. In the course of my journey to Rungpore, I was much struck with the apparent increase of the sugar cane

cultivation and the establishment of *golahs* in various villages, from which it is purchased by the Beparees and sent to the marts on the river Jenae, and thence to Calcutta and other large towns. I find that the sugar cultivation in Rungpore has more than doubled in extent within the last 5 years in consequence of the increased demand on the article; it was stated to me that 3,50,000 beegahs of cane cultivation are now to be found in Rungpore, chiefly in Pergunnah Boda, Kajeerhat, Surooppore, Koondy, Buttasun, Pyrabund, and Boroobheela: I have now by me a list of the various *golahs* or places where the best grained sugar (*chenee*) is first collected from the ryotts, with the capacity of each; there are no less than 94 *golahs*, capable of receiving 26,520 maunds; the whole quantity of sugar produced is stated at 50,000 maunds, but if the extent of beegahs under sugar cultivation above-mentioned is correct, the produce must be very much greater; however there is no doubt that 50,000 maunds* of sugar are produced, this being calculated on good data, whereas the extent of beegahs is, I suspect, a mere guess; the sugar being manufactured in various ways and of various qualities, the value of this cannot be taken at less than 4,50,000 Rupees; the profits are chiefly in the hands of the native venders, the ryotts being almost all in debt, and forced to sell at a low price, while they have to pay a ruinous interest for their debts. I am informed that a native manufacturer can produce his sugar at 5 rupees or 5 rupees 8 annas a maund, while the Europeans who have tried it find that it stands them in 7 rupees 8 annas a maund of 80 Sicca to the seer: there seems to be reason to believe that the proper mode of manufacture is not well understood in Rungpore: however, it is plain from the late increase in the cultivation, that the sugar fetches a remunerating price in Calcutta, though it is often sold there as Ghazee pore sugar. I have by me detailed

* This 50,000 maunds includes only what is sent to the *golahs*.

accounts of the cost of production, with which I do not think proper to trouble the Board ; but I have mentioned the state of the cane cultivation, because it shews that the natural direction of the cultivation of the district is to sugar rather than cotton.

10. The other staple products of Rungpore are *Indigo*, the cultivation of which is estimated at 1,20,000 beegahs, producing from 3,000 to 7,000 maunds of Indigo according to the season ; three-fourths of this is produced by the European Planters, at for 115 to 160 Rupees a maund (say 130 average) worth 3,90,000 Rupees to 9,10,000 Rupees.

Rice, the extent cannot be given, but estimated at half a crore of maunds ; *Turmeric*, 15,000 maunds at Rs. 1-8 to Rs. 2-8 per maund. *Ginger*, about 75,000 maunds at Rs. 4 a maund, is exported from the district ; this export has fallen off lately, it amounted formerly to 2,00,000 maunds.

Silk, 500 maunds only, at from 7 to 9 Rs. a maund ; this has fallen off, but is on the increase again.

Tobacco, this has much fallen off lately in consequence of the introduction of the Arracan and Tenasserim Tobacco. Not above one-half is now exported in comparison with former years, but it is still stated at 1,00,000 maunds, worth 2 Rs. a maund.

Hides and Gunny bags have lately been exported to a considerable extent ; or from 40 to 50,000 hides, and 60 to 70 lacs of pieces of Gunny.

11. The Board will observe that the amount of these exports shews that the district of Rungpore, which gives a revenue of only 12 lacs of Rupees, is in a highly flourishing and improving state ; the introduction of Cotton from Mexican seed would no doubt be a great source of profit to the people, but the experiment must be made by the Government in the same manner as the Indigo is cultivated by the Planters, and to such an extent as will satisfy the ryotts that it will answer and pay ; they cannot be expected to abandon

their own staples, and to risk an experiment which is often attended with loss, until the proper method of management has been ascertained. I trust that the directions I have sent to the Collector, as above detailed, will meet the approval and have the sanction of the Board. I have, &c.

(Signed) **WELBY JACKSON,**
Commissioner.

P.S. Since writing the above, I have received a letter, dated the 3d. instant, from the Collector of Rungpore, from which I learn that Mr. Terry is again suffering from illness, and unable to proceed to the interior; and further that he does not think he will ever be able to endure the climate of Rungpore; under these circumstances further proceedings under his superintendence are at present impracticable, and either we must await Mr. Terry's recovery, or some other person can be sent in his place. I can still, if the Government do not object, order the Collector to make the experiments I have suggested, by making advances and giving seed to the ryotts in various parts of the district.

7th January, 1845.

*Extracts from Reports on Cotton and on the Experimental
Cotton Farm at Gorruckpore.*

(Communicated by the Government N. W. Provinces.)

To the Secretary Agricultural Society, Calcutta.

Rev. Dept.

SIR,—I am directed by the Honorable the Lieutenant Governor to place at the disposal of the Agricultural Society, and for publication in their Journal, the accompanying extracts from Reports on Cotton, by Mr. Blount, the American Cotton Planter.

I am, &c.,

A. SHAKESPEAR,

Agra, 5th March, 1845. *Asst. Secy. to Govt. N. W. P.*

Extract from a letter from the Government Cotton Planter at Goruckpoor to the address of the Collector of Goruckpoor, dated 1st October, 1844.

Para. 1. I have delayed making a report on the Government experimental cotton farm under my charge at this station, for the reason that at different stages of the cultivation in previous years, the appearance of the plants has always been so flattering as to induce me to report favorably of the prospect, when the result has been, that my expectations have not been realized. I therefore thought it best to wait until I should be able to report definitely as to its success or failure for this season; and I now much regret to have again to report a total failure of the experiment at this farm.

2d. This season has been quite different from that of 1843; in that year there was rather a scarcity of rain; this season has been a very wet one, yet the result of both season's experiments has been the same; a failure. At the first setting in of the rains I had the old plants pruned, and they immediately threw out vigorous shoots, and judging from the quantity of flowers and young pods, promised to yield a most prolific crop, but as in the previous year's experiment, the fruit has dropped off before arriving at maturity. This has not only been the case with the American, but with every other description of cottons on this farm, with the exception of the Nurma and Kooklee cottons of this district, which I presume must require a peculiar situation or soil, for on the sandy soil of this farm it has not even blossomed.

3rd. The new plants of this season are very small, and have as yet shewn no disposition to produce, particularly the American, which will yield nothing.

4th. Five and a half beegas of American and Jubbulpoor cotton, which I planted on fresh land at the grant of Mr. McComish, has grown to a much larger plant than that on

the farm at the station, but has been damaged so much by worms, that under the most favorable circumstances it can produce only a very scanty crop.

5th. The Bourbon and American cotton planted in February by irrigation, have both grown very large, but have not yet produced any flowers.

(True Extract,)

A. SHAKESPEAR,
Asst. Secy. to Govt. N. W. P.

*To H. C. TUCKER ESQUIRE, Magistrate and Collector of
Goruckpore.*

SIR,—According to instructions received in a letter No. 4864, of 1844, from J. Thornton, Esq. Secretary to the Govt. of the N. W. P. to E. P. Smith, Esq. Commissioner Benares Division, dated Agra, 31st October 1844, directing me to visit every portion of this district to examine such cotton crops as I might see growing; to give instruction regarding the cultivation of the plant here, and to furnish a report on the adaptation of the soil and climate to the production of cotton;—I have the honor to report that since my residence at the station of Goruckpore and during the winter of 1843, I travelled over a large portion of the district, South and N. W. of this Station. The Eastern portion of the District I had never visited, I therefore proceeded on a tour in that direction, through the country near and contiguous to the great Gunduck river. During the whole of my route I met with no fields of cotton; some few plants I saw growing in the Urrur *khets* and immediately round the cabins of the ryotts. Throughout the whole of this district the cultivation of cotton is very limited. In the Eastern portion where it is planted as a crop, the cultivation is not sufficient to supply the wants of the population. In different places, the same cotton is frequently called by a

different name. The plant known here, however, is classed under three heads generally, the Kooklee, the Bogalee and Nurma. The first named is mostly cultivated; it is planted in February and gathered in June and July following. It is an inferior description of Nankin cotton, it however makes a strong coarse cloth, and is a prolific plant, and yields, as I was informed, from three to seven maunds (of 80 pounds) of *cupas* per bēga of 3136 square yards. I very much doubt the correctness of this information, for if such a produce can be got (it would be a paying crop to the cultivator,) I cannot imagine why it should not be more extensively cultivated. Any surplus over the ryotts' wants would find a ready market in the neighbouring bazars. I could learn of no objection to its cultivation by the natives, but this, that it required more labour to grow and gather it than other crops.

2. The Bogalee and Nurma are very little cultivated. The first is planted with *Muckha* and *Urrur*, at the commencement of the rains; the Nurma is planted round the huts; both produce in February and March, and give but a small return. In almost any portion of the district a plant of cotton may be met with, but nothing like a cultivation except in the Eastern portion.

3. There is but little variation of climate so far as regards heat, cold and rain; some portions are more sickly owing to their situation. For the two years I have been here, I have experienced but little if any hot winds. The monsoon usually sets in about the 15th of June, and continues until the end of September, after which there are heavy dews throughout the cold weather. In so large a district there is of course a variety of soils, which are classed under five heads—the Muttea, a rich dark soil; the Ballooa, or sandy soil; the Dorus, a mixture of muttea and bullooa; the Bhat, clay and sand with chalk; and the Bauger, yellow clay and sand. The bhat though it is not so rich a soil retains its

moisture throughout the year, and is the land on which the cotton to the Eastward is usually planted. This kind of land from the fact of its retaining the moisture, is I think to be preferred for cotton cultivation; and for the trial of an experiment, I would give the country near the Gunduck, where this land prevails, the preference. The objection to the other qualities of land is the dryness of their soils, and they do not retain a sufficiency of moisture but for a short time after the rains have ceased. There are other portions of the district where the cotton plant would thrive well, particularly on the new lands of the grants,

On the jungle grant of Mr. McCo-
mish near this Station, I planted about
five begahs in American and native
cotton. The native is not very good,
but the American is without doubt
the best I have seen since I have been
in the country. The plants are
weighed down with the fruit, and the
pods are quite as large as they attain
in the United States. If I can secure
this field from theft, I think it will
yield three or four hundred pounds of
cupas per acre.

where as yet the soils contain a
quantity of vegetable manure,
but there would be great diffi-
culty in procuring a sufficiency
of labor to try an experiment
to any extent on the grants. To
the Eastward, near the Gunduck,
where the native cotton is culti-

vated, the country is not deficient in population; and the experiments might be carried on there to any extent desired.

4. From the result of this season's cultivation, it would appear, that the failure of the experiment is not owing to the unfitness of climate and soil, but to the ravages of insects, and this I think proved from the fact that since the cool weather has set in and chilled out the worms and insects, the plants have reproduced, and are now yielding some cotton.

5. From these remarks, I do not mean it to be inferred that another trial here would meet with success. There is no difficulty in growing the plants, but there is no security of gathering a crop of cotton from them, unless the worms and bugs could be got rid of; the production of the plants this season is owing to the mildness of the weather which

has been just cold enough to destroy the worms, without injuring the plants.

I have, &c.

(Signed) S. M. BLOUNT,
Government Cotton Planter.

*Office of the Govt. Cotton Plantation,
Goruckhpoor, the 18th Jany. 1845.*

On the Chinese methods of Tile and Brick-making, of burning shells for Lime, of expressing Oils, &c. Communicated by A. GRANT, Esq., Bengal Medical Service.

To J. HUME, Esq., Hon. Secretary, Agri-Horticultural Society.

DEAR SIR,—I beg to forward for the Agricultural Society some specimens of Chinese seeds and manures, of which I enclose a list. I send also, as promised in my last note to you, the drawings with letter-press descriptive of the Chinese methods of tile and brick-making, of burning shells for lime, and of expressing oils, to which I have added a sketch of their ordinary cooking range. I am very desirous to have these attached, if possible, to the “Diary of Chinese Husbandry,” as I believe the whole together would convey a tolerably correct idea of the economy of a Chinese farm.

Yours, &c.

ALEXANDER GRANT,
Bengal Medical Service.

Calcutta, 7th January, 1845.

Memorandum.

1. The seeds of the Medick or Trefoil.
2. Ditto in the compost in which they are sown.
3. The wood-ash which is applied to the leaf of the Trefoil.
4. Ashes of the various grasses taken fresh from the furnace.
5. The composition of earth and ash, in which the seeds of most grains are sown, particularly in hard clay soils.

6. Oil cake, the refuse of the expressed seeds of the vegetable tallow tree, (*Stillingia sebifera*.)

P.S.—The manures are those requested in the queries by Dr. Playfair.

7. A species of millet.

8. A species of bean.

9. Oil and varnish nuts.

10. A species of bean.

11. Sweet potatoe cut up and dried, it keeps long, and would be valuable to seamen on long voyages ; it is dried in the sun.

Tile and Brick-making.

The bricks made in China are of a blue color, very hard, and when struck they elicit a sharp metallic sound. The clay is principally procured during the digging of Canals, it composes the deep soil of the vallies, and is the long accumulation of decomposed trap that has been washed down from the sides of the hills. When it is intended to cut out a new line of Canal, there is raised in the immediate neighbourhood a large temporary shed made of bamboo, and thatched with loose paddy straw, this forms the tile and brick manufactory ; close to this again is the burning kiln, and between both is an open space for temporary drying in the sun. The expense of the whole is very inconsiderable, and a man of the most moderate ingenuity could make for himself the whole of the tile apparatus, during the leisure hours of a day.

EXPLANATION OF THE PLATES.

Plate I.

Figs. I and II.—Represent the instruments for severing the clay ; *a.* is a coarse framework, and *b.* a strong brass wire stretched between the extremities *c. d.*

Fig. III.—Is the mass of clay finely prepared, and shaped into proper form, *b.* is a wooden support for the mass. It is sliced horizontally from the upper surface by the small machine represented in figure IV.

Fig. IV.—*a.* is the handle, *b.* the frame, *c.* the wire, and the space between *c.* and *d.* is the thickness of the tile.

Fig. V.—Is the mould upon which the slice of clay is laid, this mould is covered by coarse muslin to prevent the clay from adhering, five tiles are made at once, the mould is placed on the summit of figure VI. which is a block of wood revolving on a pivot; a slight circular motion is given to this, and the labourer applying a little water to the surface of the clay, smooths it by the concave piece of wood represented by figure VIII. He then determines the length of the tile, which is done by the simple bamboo instrument represented at figure VII. The mould is then carried to the temporary drying ground, it is separated from the clay by passing one of the two handles marked *b.* within the other, the muslin bag is next removed, and there is then left a hollow cylinder of clay rather narrow at the top, and which when partially dried and being gently struck separates into five tiles. The whole is the work of a few moments.

Plate II.

This plate represents four different kinds of moulds for bricks.

Fig. I.—Represents the mould of a form of brick very much used in running up partitions, it is hollow on one side, and into this hollow a piece of split bamboo is laid by which means each row of bricks is joined, and greater firmness given to the whole.

Fig. IV.—Is a mould by which two thin bricks are made at once by division with a wire at the sulcus *a.* —.

Specimens of these moulds could be easily procured at a very trifling cost.

Lime-making.

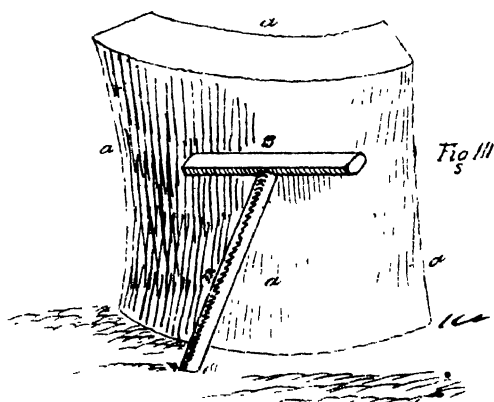
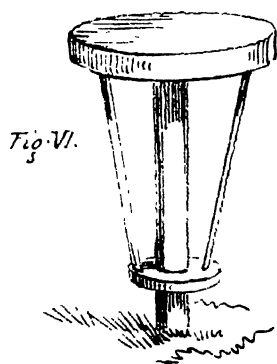
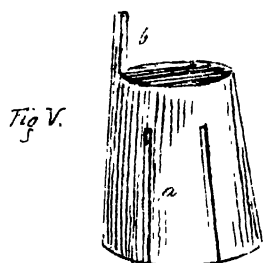
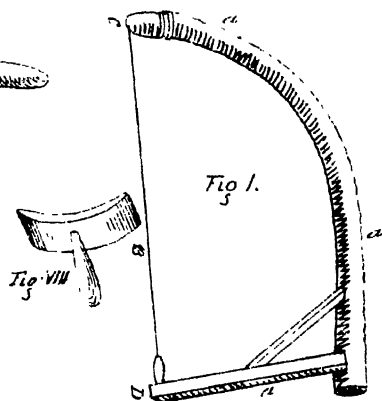
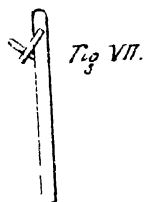
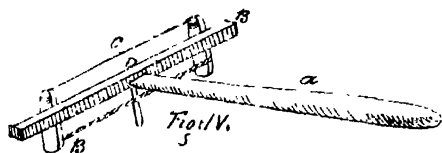
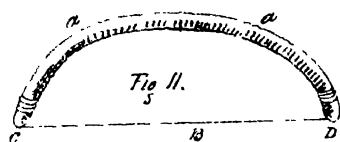
The lime is procured at all the parts of the east coast of China, which I have visited, by burning the shells of the genus *Ostrea*, which abound on the neighbouring shores. It is too valuable to be much used in agriculture, but the Chinese are not ignorant of its uses.

Plate III.

Fig. I.—Represents the front of the kiln: *c.* is a plain brick wall with an open hearth in front, against which a pile of shells is heaped; *a.* is a hollow space, filled with charcoal; *b.* is the communication with the blowing apparatus, through which active ignition is kept up.

Fig. II.—Is a back view, and represents the air-bellows: *a.* is the handle; *b. b.* is a large door hung from a cross beam, and moving in the sides *d. d.* which are coated with clay, and kept moist; this simple

Patented Brickmaking



Tile and Brick making

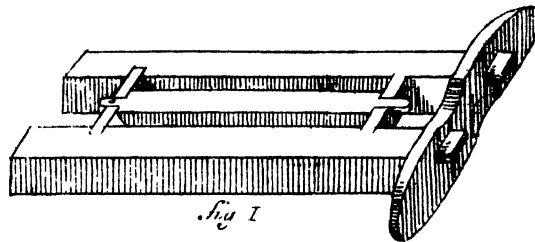


Fig. I

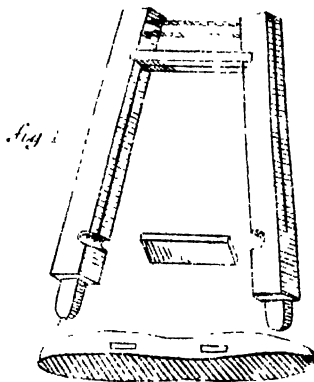


Fig. II

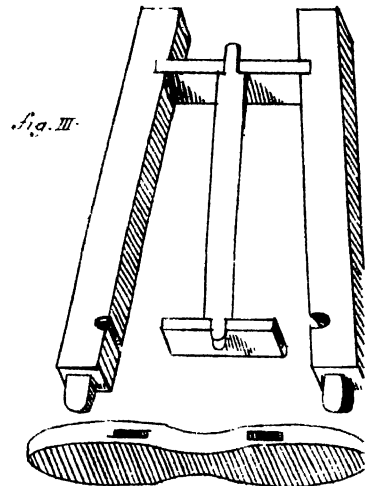


Fig. III

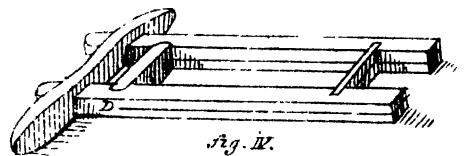


Fig. IV

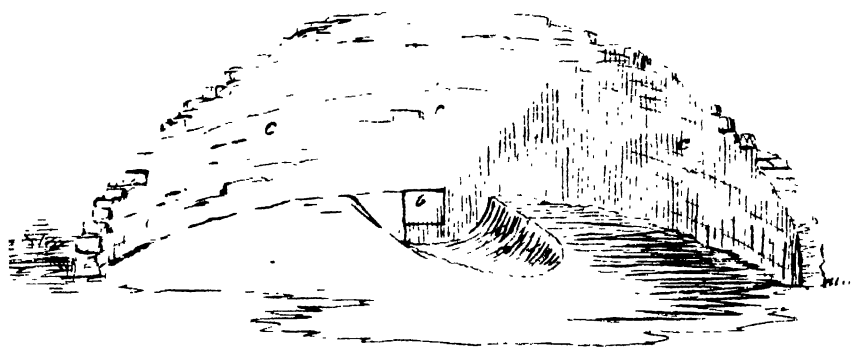
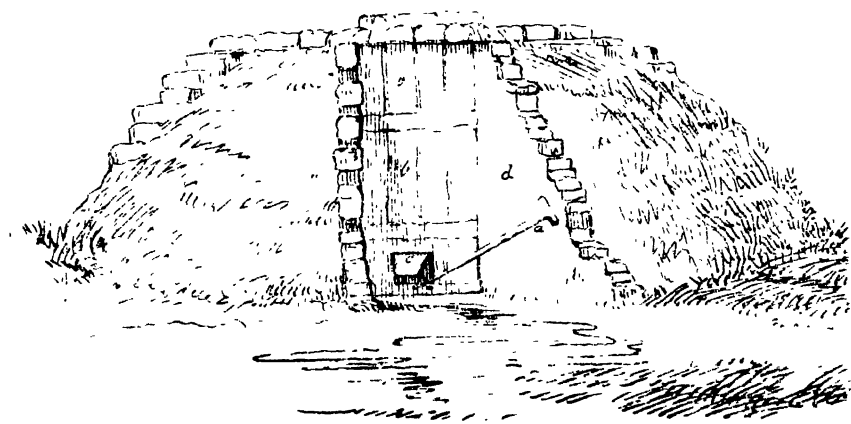
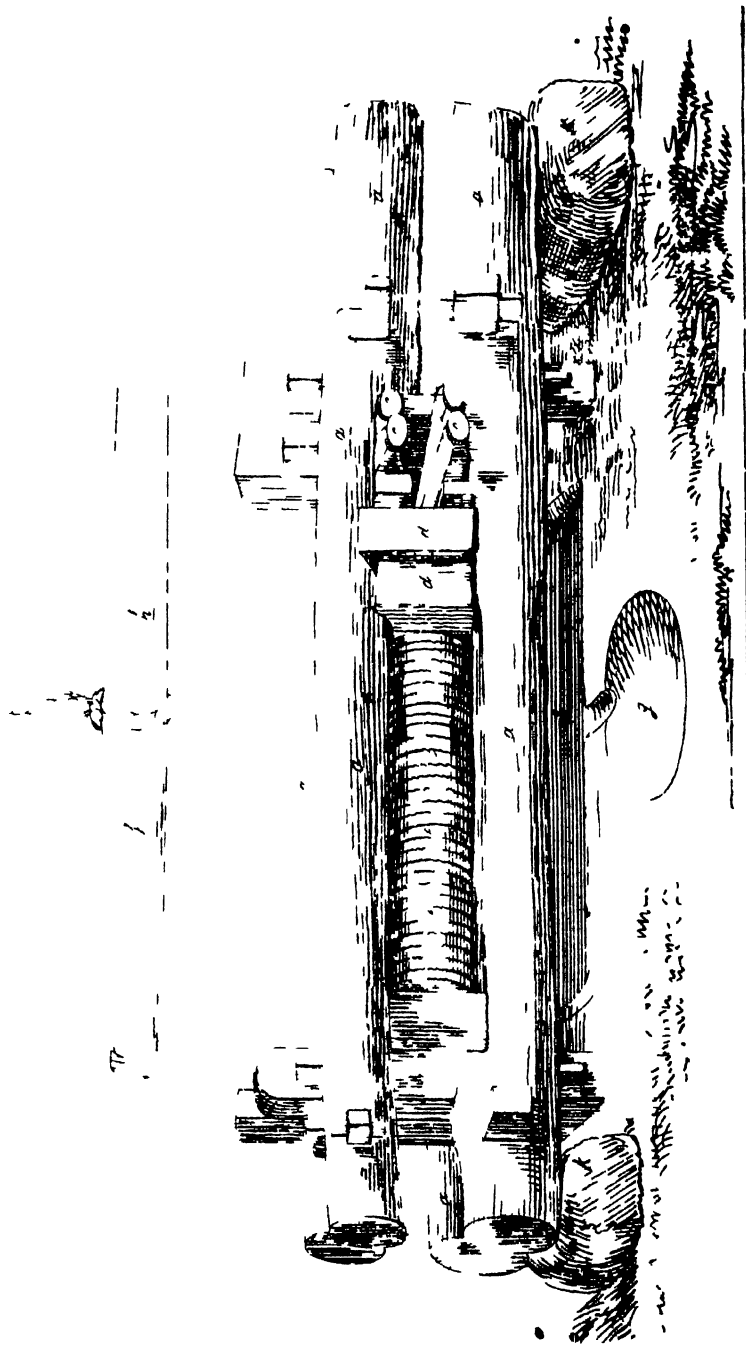
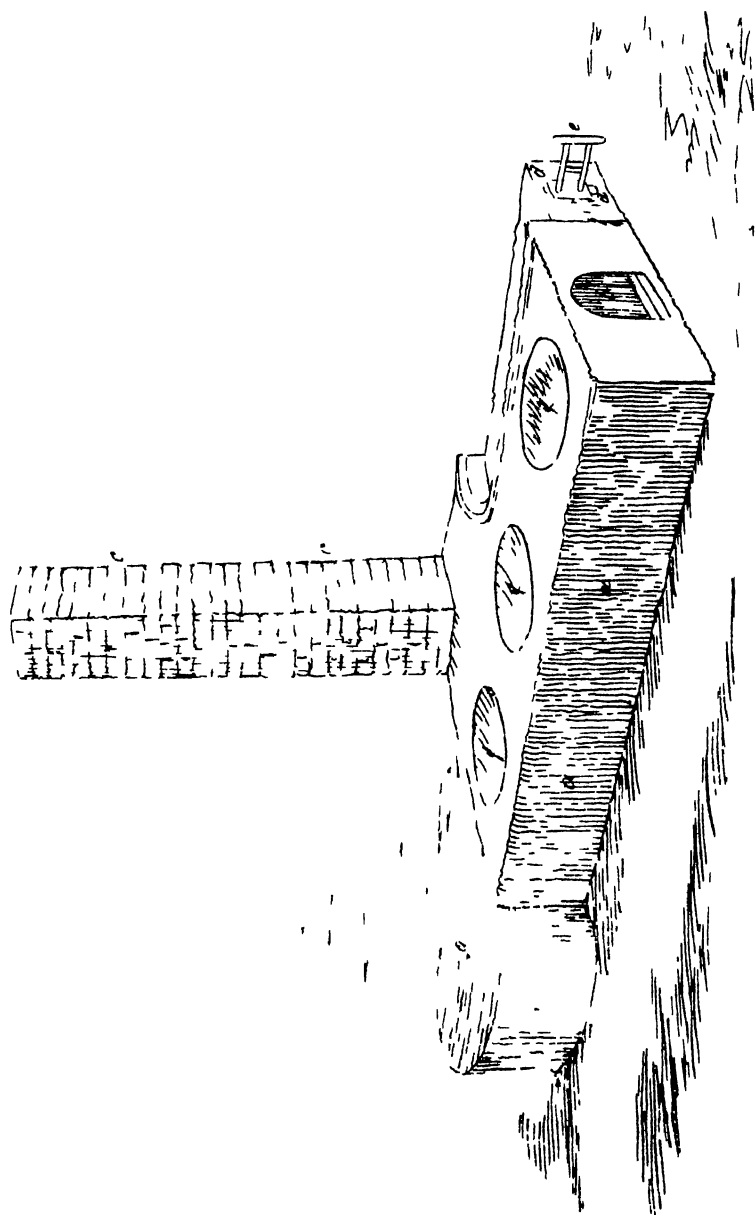


Fig 2







measure makes the suction complete: *c.* is the valve in the door. It is worked by one man, it costs but very little, is effective, and not liable to get out of order.

Oil Press.

Plate IV.—This plate represents an oil press in full working order. It is used chiefly for expressing the oil from the seeds of the tallow tree (the *Stillingia sebifera*). It is rude, but effective, and is worked by three or four men.

Explanation.

a. a. are four logs of wood, the two lower of which rest on blocks of granite *k. k.*, and the whole are firmly knit together by the four perpendicular posts *b. b.*; *c. c.* are four large wedges shod with iron; *d. d.* two blocks, which move in the channel between the cross beams; *e. e. e.* are a series of round hoops made of twisted bamboo, and which when joined together, form a long cylinder; into this cylinder the seeds (previously cleared of their outer or white waxy part) are placed by bundles bound in common straw: the work then commences. Three coolies seize hold of the heavy beam *h. h.*, which hangs from the roof by the ropes *i. i.*, and running a few steps backwards they then advance and strike with a sharp and strong impulse some one of the wedges at *c. c.* As these are driven in, the blocks *d. d.* advance, and press the cylinder *e. e.*; by which means the seeds are subjected to a powerful compression, the oil oozes out from between the interstices of the hoops, and dropping in the stone gutter *f.*, is finally collected in the trough *g.*

A Cooking range.

Plate V.—*a. a.* is a brick wall enclosing the fire-place, which extends throughout its whole length; *f.* is the mouth of the fire range; *c. c.* is the chimney; *d. d.* is a box bellows, of which *e.* is the handle; the attendant blows the bellows (which is a fixture) with the one hand, while he feeds the fire with the other; *f. f. f.* are three flat iron pans, which are all that are necessary for every variety of Chinese culinary operations. They cook a good deal by steam; a grating is placed over one of these pans filled with water; on this grating perhaps a dozen dishes of vegetables are placed; a deep cover surmounts the whole, and confines the steam.

Their firewood consists almost entirely of brushwood or straw, and this range is admirably adapted for consuming such materials without much loss of heat.

Communication from MR. SOUTHEY, on the improvement of the breed of Sheep in India.

(Presented by the Bengal Chamber of Commerce.)

J. HUME, Esq. *Secretary Agricultural and Horticultural Society.*

DEAR SIR,—I am desired by the Chamber of Commerce to transfer to you the accompanying communication, received from Mr. Southey, on the subject of improving the breed of sheep in India, so as to obtain a superior quality of wool, whose export may be alike beneficial to India and to the manufacturers of England.

The Committee of the Agricultural Society, the Chamber deems to be the most competent to appreciate the merits of Mr. Southey's suggestions; and to take steps, if approved, to have the proposition tested by a series of experiments in this climate.

I have, &c.

W. LIMOND,

Secretary.

*Calcutta Bengal Chamber of
Commerce, January 9th 1845.*

WILLIAM LIMOND, Esq. *Acting Secretary to the Bengal Chamber of Commerce, Calcutta.*

SIR,—Having on more than one occasion been requested by the Honorable the East India Company, and also by the East India and China Association, to offer an opinion on sundry samples of Indian sheep's wool, which they have at various times received from India, and to suggest such means as I conceive likely to improve the breed of Indian flocks and qualities of their fleeces, I take leave, at the recommendation of Mr. Stikeman, to forward you the accompanying samples, the produce of cross breeds betwixt a Bengal ewe and an English Merino ram, the property of the Right Honorable Lord Western, from which may be

seen the advantage likely to accrue to Indian flock-masters by due attention being paid to the cultivation of the breed of sheep in our Indian territories and dependencies, and I humbly conceive that with increased attention, wool may become a source of wealth to our Indian possessions, at the same time prove an article of incalculable benefit to the manufacturers in the British nation.

Being personally acquainted with many gentlemen who have long resided in India, I have heard what appears to them impediments in carrying my views into effect; to which I reply, "Make it an object to the owner of sheep to accomplish the desired end, and you must succeed."

Col. Jervis has already demonstrated, that with due care a superior race of sheep may be reared, producing wool infinitely more valuable than the native stock; and I flatter myself the time is not distant when the wool of India will be so much improved in quality as to be classed in our wool reports amongst those of our other wool-growing colonies.

I remain, &c.

London, 30th Oct. 1844.

THOS. SOUTHEY.

P.S. You will be pleased to lay before your Chamber of Commerce the accompanying samples, and give as much publicity to the subject as you may deem proper.

To the Honorable Court of Directors of the East India Company.

HON. SIRS,—In presenting to your Honorable Court the cost and expenses attending the purchase of 12 Merino sheep from the flock of the Right Honorable Lord Western, which were bought by directions of your Honorable Court, I cannot refrain from offering the following observations on the wool of a Bengal ewe, which were shown me by his Lordship whilst on his domain, together with her progeny to the second.

generation; and his Lordship having kindly presented me with a fleece of each year's produce, I have much pleasure in presenting to your Honorable Court specimens of the three years' growth, which I presume will clearly illustrate, that by ordinary attention, the present breeds of Indian ewes may be converted into wool-bearing animals, producing wool that would realize double its present value.

No. 1. Native Indian Ewe.

„ 2. First cross, with a Merino Ram.

„ 3. Second cross, with a Ewe of the above.

„ 4. Sample of Merino Rams, wool shipped to Madras per “Lady Flora.”

It affords me great gratification in thus demonstrating to your Honorable Court, a theory which I have long entertained, that the flocks in your Honorable Court's territories in India and your dependencies, is capable (with ordinary attention) of producing wool, both as to quality and quantity, that would become an article of vast importance, both to the flock owner in India, and the British empire.

I have, &c.

THOS. SOUTHEY.

Coleman Street, 31st Oct. 1844.

THE JOURNAL
OF THE
Agricultural & Horticultural Society
OF
I N D I A.

Observations on the quality, &c. of the principal Timber trees growing in the vicinity of Jeypore, in Upper Assam. By Capt. S. F. HANNAY, (40th Regt. N. I.) Commandant of the Assam Light Infantry Battalion.

(Communicated by Major Francis Jenkins, Commissioner of Assam.)

MY DEAR JENKINS,—The clearing of the jungle in and around the station of Jeypore having enabled me to make a collection of samples of the different timber trees, I have the pleasure to send a list of 38 sorts collected here, and through the agency of Mr. Bonsall, of the Assam Company, from Hookungooree, with a few I had before collected at a former period. Most of the trees in the list will be found to correspond with those published in Mr. Masters' Catalogue of timber trees of Upper Assam,* and as they comprise all, I believe, of what may be called "forest timber trees" growing on the plains and in the Hills, it may be considered of importance, with reference to the future timber trade of Assam, that the different samples and list should find a place in the rooms of

* This Catalogue will be found in Vol. III. page 6.—Eds.

the Agricultural and Horticultural Society, for the inspection of the timber merchant. I wish that I could have made a better selection of samples, but this is not so easy a matter, in the absence of workmen. I shall however try and make up for this by my own opinion, formed from experience as to the qualities of some of the kinds, the general opinion of the country as to the uses and properties of all, together with a few observations on the localities of different forests, and the practicability of obtaining the best kinds for exportation.

No. 1.—Nahor or Nagesur, an exceedingly hard and durable timber whether it be heart-wood alone, or accompanied by more or less of young wood. There are two kinds however, the Dareeka Nahor and Bor Nahor, the former containing most heart-wood, and is deepest colored. The grain of both kinds is sometimes prettily veined, and some few specimens of the sort I have seen, were exceedingly beautiful. The Nahor is highly prized for posts of houses, as they last for years; the outer wood however, particularly of young trees, is liable to decay, if not in the first instance seasoned; however, it is necessary to mention here, with regard to the Nahor, as well as all other woods employed in building or for any purpose in Assam, that little attention is given to seasoning, or even as to the proper season and time for cutting timber trees; and consequently, many timbers which, with proper precaution taken in this respect, would prove valuable and lasting, are subject to premature decay and the attack of insects. The white ants cannot touch the heart of the Nahor, after it has become thoroughly seasoned, and it is employed by the natives in every thing requiring strength and durability as well as elasticity, which last quality I think debars its use for beams, upon which any considerable dead weight of masonry is to lie; but this probably requires to be tried. The Mishmies of the Brama-koond make their spear-shafts of it; I should say however, that they use very young trees for the purpose,

from the paleness of the color, but nothing can exceed the beauty of its polish merely from hard rubbing, and in this state, I have often said that it was exceedingly like the lance wood of America.

The Nahor is a very handsome tree, growing to an immense size in some parts of this neighbourhood; its flowers are very pretty, with a most pleasant fragrance, and its delicately colored young leaves are worn in bunches to adorn the hair, and stuck through the ear-lobes of both sexes of the frontier people. From the seeds, when ripe in October, nearly fifty per cent. of oil can be expressed, which however, although possessing medicinal properties equal to *Petroleum*, in diseases of the skin, besides being a good lamp oil, as usual, our inert population never think of using. From the tree, making incisions in the bark, a fragrant balsam exudes, which alone, or diluted with oil of turpentine, makes a very good wood varnish.

The Nahor is common I believe in some parts of Lower Assam, but not so much so as in Upper Assam, where it seems to thrive best on the red clays of the secondary formations. On the Dhunsiree in the direction of Dheimapore, there is a Nahor Forest; there is a Nahor Forest also near Dibrooghur,⁽¹⁾ but I have never seen this tree, of the size equal to what it is in the lower range of Naga Hills, south and south-east of this place, particularly on the spur which separates the Taorak and Dillee rivers; here, and also on the hills between Jeypore and Hookungoori, although it cannot vie either in height or girth with the splendid Hoolung, Mekai or Teha-

(1) There is an extensive wood of Nahor trees near Dibrooghur, as mentioned by Captain Hannay, but I doubt its being a natural forest; I conceive that all the ground now occupied by this forest was not long ago village land (Barris), and that the Nahor trees have propagated themselves to the extent we now find them, from the seeds of the trees which had been planted in the villages or along the sides of the road to form avenues. I do not recollect to have seen the Nahor tree in any genuine forest (Habbi, of the Assamese) but I think wherever I have met this most ornamental tree it has always been on land that could be traced to be deserted villages.

—F. J.

um, it is nevertheless a fine and noble tree, its gnarled and knotty stem seeming to bid defiance to the axe; indeed it is evident that when such an obstinate denizen of the forest lay on the line of road first opened by the Assam Tea Company to Hookungoori, it was found the easiest mode of cutting these down to use the cross-cut saw.

No. 2.—The *Jutelee* is a heavy, hard, and probably durable timber, but from its scarceness on the plains,⁽¹⁾ I am not able to ascertain its qualities; it has the name however of being equal to the Nahor for strength and durability.

This tree grows to an immense size; there is one visible about $\frac{3}{4}$ of a mile from the lines at Jeypore, which overtops the whole neighbouring forest; a plank from $3\frac{1}{2}$ to 4 feet wide might be cut out from the lower stem; from the seeds a beautifully clear and fragrant resin exudes in drops from fractures; and from knots also, there is a collection of softest resin, which burps freely, and emits a strong odour of Gum-Benjamin.

I have seen the *Jutelee* of considerable size on the plains in Muttock, but solitary trees only. In this neighbourhood it is associated with the Nahor and other trees, and may be considered as a forest tree.

No. 3. *Mekai*.⁽²⁾—Although unable to speak to the qualities of this as a suitable timber tree, under proper management as to time of felling and seasoning, I have reason to believe it would prove a very valuable timber.

The *Mekai* grows to an enormous size both in girth and height, and has a beautifully smooth stem, quite free from

(1) The *Jutelee* is very abundant on the plains in Muttock, and not in single trees but extensive groups; it is one of the most ornamental trees I know, the trees being lofty, generally growing in 3 or 4 stems from one root, and branching out close to the ground, and the foliage is light and handsome, something like the poplar.—F. J.

(2) The Assamese do not extract from this *Dipterocarpus*, an oil, as is done on the coast of Arracan and Chittagong: and it may be neither of the species which there produce wood oil. Mr. Masters, it will be observed, does not determine the species.—F. J.

knots ; there are two kinds, one of which furnishes a gum resin in great quantities ; spontaneously oozing out from under its scaly bark, particularly during the hot days in May, when it may be seen hanging in icicles several yards long, and frequently as clear as crystal ; the Nagas who bring it sometimes for sale, tap the tree, and I have seen it in tears of a clear amber color, of about a pound weight. It is not an uncommon thing to see some of these Nagas wearing a piece of this gum resin through the lobe of their ear as an ornament ; specimens of this gum have been sent to Calcutta, but I have never heard the opinion given of it. It is not *Gum Copal* nor can it be "*Gum Anemi*," as it does not possess sufficient toughness to form a good and lasting varnish with linseed or turpentine. It seems to contain in itself a volatile oil which causes it to be easily affected by the heat of the sun ; if this was evaporated or distilled off, probably the residue would be better adapted for a varnish by itself, or united with other gums.

No. 4. "*Hoolung*."⁽¹⁾—I am unable to speak as to the qualities of this tree, as a timber, but small trees have been lately used in bungalows as beams, and they seem to season and answer very well, and the insects have not attacked them. I am told by the *Dhoanneas* that excellent canoes are made from the *Hoolung* ; they last well, but are rather heavy. From the name of the tree, *Hoolung*, and *Hoilung* or *Harlung*, a large canoe, a Shan word, it is possible that the name is derived from the circumstance of the Ahoms having used this timber in forming the war canoe of former days.

The *Hoolung* even surpasses the *Mekai* in size, and is perhaps one of the largest timber trees in nature ; it is associated with the latter, and forms with it, immense and splendid forests rarely to be surpassed for size of timber. Whether the *Hoolung* is the wood oil tree of Burmah and the Arracan coast, I cannot say, but by tapping the stem, quantities

(1) Holong of Mr. Masters.—F. J.

of a fragrant balsam of the consistence of ghee, and having all the qualities of the wood oil, is obtained.

No. 5. *Tehaum*.⁽¹⁾—This is a fine timber tree, both as regards the quality of its timber and size as a forest tree, the dimensions often equalling in girth and length the Mekai and Hoolung, with which trees it is associated in the forests of the lower Naga ranges of Hills.

The wood of the *Tehaum* is noted both in Sylhet and Assam as a timber of excellent quality, and I believe it to be so : I have seen a table of great beauty made of the Sylhet variety, which appeared very like the Mirabow⁽²⁾ wood of the Straits of Malacca. In Assam (i. e. Upper Assam) there are two kinds, one the “Kon’tal *Tehaum*,” the fruit of which the natives eat ; large trees when procurable at convenient distance from a river, are particularly prized for Hoolungs⁽³⁾ and Khel boats,⁽⁴⁾ for boats this wood is considered of first quality.

No. 6. “*Joba Hingooree*.”⁽⁵⁾—This is a species of oak, which growing only on the Hills, is only used by such of the natives who have the tree growing near them. The specimen sent is not a good one, being from a small tree ; the timber of old and larger trees being darker colored and veined more like the oak. Amongst the Singphos, it is preferred on account of its hardness for implements of husbandry.

The above species of oak is associated with the Bor Hingooree and Kanta Hingooree, Nos. 7 and 8, in the ranges of

(1) Sam of Mr. Masters.—F. J.

(2) See page 81 of this volume, (department of “Correspondence and Selections,”) for a list of the timber trees of Malacca, wherein it is stated that the “Marbouw,” resists the attacks of white ants for one hundred years and upwards.—EDS.

(3) Large cargo canoes used by the merchants.—F. J.

(4) Light pleasure boats, sawarree boats.—F. J.

(5) Hingooree or Singooree, is the provincial name of all the oaks and chestnuts ; of these genera we have 20 or 30 kinds in the valley of the Berhampooter and its adjacent hills.—F. J.

Hills, but the last named are also found in the plains at the foot of the Hills.

The timber of the last named would, I think, under proper management, prove a very serviceable timber : both, when green, split very readily, and good rough hewn planks are very easily formed, in which state it would season well, and would be the best form probably to raft it for exportation.

The only thing of note regarding these last, as regards use, is that the Rajahs of Assam appeared to have been alone permitted the use of the Hingooree in building ; the palace of the kings being designated *Hingooree Ghur*. The natives eat the seeds of these castaneas, or species of chesnut.

No. 9. "*Sopa*."—Of this tree there seems to be no less than five varieties, of which however I can only distinguish three⁽¹⁾ in the samples now sent, Nos. 9, 10, and 12.

Teeta Sopa and Kureeka Sopa, appear to me to be a very superior description of timber, and are noted amongst the natives for their durability, lightness, and strength; the former is much prized for boats. They are not so common here, as a forest tree, as the Mekai, Nahore, and Hoolung, but I have reason to believe they are more so in the forests on the north bank of the Burumpooter. The "*Tita Sopa*" is a common drift timber of the Burumpooter, and some boats of this wood of a large description, are yearly brought by the boat cutters of the Dihong river. In October 1844, I saw on the sands of the Burumpooter, a stem of the Tita Sopa of hard, well seasoned heart timber, 30 feet long and about 4 feet in diameter. It grows in the plains, also in this neighbourhood, and of sufficient size to prove useful. The Foolsopa is a light fragrant wood, but does not appear to stand exposure to the weather like the Tita Sopa, the bark of which is astringent, and eaten by the natives with Pawn ; the sweet smelling flowers of the Foolsopa are well known.

(1) The list gives 4, I presume they are all (Champas) *Michelias*. Mr. Masters has three in his list.—F. J.

No. 13, Heleekha.⁽¹⁾—This is a strong and durable timber, esteemed for house posts, not being liable to decay. The fruit of this tree is astringent, and is eaten by the natives. Hindoostanees say the fruit is the same with the Hurr (?) a common medicinal berry, sold in the bazars of India.

The Heleekha is a common tree both in the plains and hills in this neighbourhood, and grows to a considerable size; it appears to me a wood deserving of attention, being very prettily veined.

Nos. 14 and 15, Bor Bola and Heela Bola.—This is a timber much prized by the Assamese, and deservedly so, for I think there are few (if any woods) excepting the teak, which surpass it for lightness, strength and durability in all situations, and it possesses some beauty also. There are three kinds of Bola, two of which only (those now sent) assimilate, the other the Noonee, or mulberry-leaved Bola, I have not been able to procure; but although of a deep yellow color and close transparent grain, it is not so much prized as the other two. Both are used when procurable as house posts, the former being the lightest is universally used to form the Buetas, or long paddles of the fishermen, and other boatmen of the province. These Buetas are either formed by splitting young trees, or cutting off pieces of sufficient size from the largest trees, the tree when fresh being easily split; each Bueta or paddle costs from 4 to 8 annas according to size, in the rough; they are finished off by the boatmen themselves, and it is astonishing to see how delicately slender they are made and yet what strain they will bear, in forcing canoes up very strong water. The wood has the quality of standing the weather well, and constantly in water, seems to harden, and get black colored; it appears to me to be admirably adapted for oars and ships' spars, and probably for building boats, if well seasoned.

Numbers of the Bola timber trees are drifted down the Burumpooter from forests of the lower Hills, bounding the

(1) Hilikha of Mr. Masters.—F. J.

valley, and when left on the sands, they are soon cut up by the dooms, or fishermen; in this way many a splendid timber is hacked and destroyed.

The Bola of a considerable size is common in the forests of the plains, particularly in Muttock.

Nos. 16, 17 and 18,—comprise three out of four species of the Toon, which are common in Assam. The Hindooree Poma is prized most, as though light, when once seasoned, it is very durable, and some splendid boats are formed of it; particularly in the Dihong River, where it would seem to be in great abundance.

The Poma is common also in the plains as well as in the hills of the Upper Assam valley on both sides of the Burampooter; the fourth variety, of which I have not been able to procure a specimen, is called Gendala Poma, and has a fragrant cedar-like smell. Fine timbers of the Hindooree and Gendala Poma are annually drifted down the Burampooter, and very splendid trees of the first named grow in this neighbourhood; trees of smaller description are also common in the forests of the plains.

Nos. 19, 20, 21, 22.—Of these four varieties the Sissoo ranks first, and probably the Moj the next. The qualities of the Sissoo are well known, and I believe the heart-wood of the Moj is nearly equal to it in durability; of the *Koroi*⁽¹⁾ perhaps it may be said that the outer wood is useless, but the heart-wood stands very well in water; the Medala looks a serviceable wood; and another of the Acacia kind which is common in some parts of Assam but not here, produces a very hard and pretty heart-wood, and is called by the Singphos *Gy-yoon*, and the Assamese *Soa*.

The Sissoo begins to appear on the *churs* of the Burampooter about Dihoroo mookh, and continues to be found from

(1) The "*Koroi*," is perhaps the Koirah of Lower Assam, which I believe is Roxb. *Mimosa Catechu*. Beng. *Khira*, Vol. II. p. 563. The wood of the large trees is of a very handsome red colour, and makes most permanent posts; the tree is abundant, but seldom allowed to grow to a large size.—F. J.

that point to Suddiah and above that place, particularly in the vicinity of the Nao Dehing mookh ; and as high up as Choonpoorah, many trees of considerable size have been cut, and probably more exist than can be seen from the bed of the river, those only being taken which were most easily got at. The Moj, Koroi and Medala are common in every tract of forest we have, the Soa is a very common and fine tree in many places, but I have never seen it as a forest tree ; but on the upper Noa Dehing near Man Mo, Dhun or old Beesa, a tolerably transparent gum exudes in quantity from this last on making incisions on the bark.

Nos. 23, 24, and 25.—Are three or four species of the Jamoon (besides the Goolaub Jamoon, or rose apple) which are very common, particularly in this section of Assam ; the most common tree in the plains of this neighbourhood being the Boga Jam, distinguished by its peculiarly smooth and white bark ; these are all noted for their strength and durability ; the Boga Jamoon grows very straight and tall, and is thus well adapted for posts and beams ; the Panee Jam, the fourth variety, (not sent,) is a stunted tree growing in low ground, of great hardness and strength like the others. The Bor Jamoon which seems to correspond with that of Bengal, is the only one of the varieties sent, the fruit of which the natives eat. The rose apple, strange to say, grows wild in the jungles. The whole of the varieties are noted for the astringent qualities of their bark.

No. 26.—This is a timber little thought of by the Assamese ; but being a species of teak, and possessing great qualities as to durability, and not being liable to decay even when put in a green state into the ground, I think it highly deserving of notice. The sample sent is not so good as might have been procured, but I had no means of procuring better ; as a proof of its durability I may mention, that a bridge at Tengri erected of this timber several years ago, is still standing, as sound I believe as ever. The *Ghorah*, I am told, grows on the

hills to a great size, and is used by the Singphos and other frontier people as house posts in preference to all other timber. It is a very common tree in the jungle, on the banks of the Burampooter, as well as every other tributary stream in the Jorehauth and Muttock districts, and is often of a very considerable size. It is distinguished by its whitish bark, and very often gnarled and twisted stem, of no great height, being a very branchy tree, these last formed as if they had been intended for the crooks and knees of boats. This wood contracts and strengthens much by seasoning.

No. 27. *Huluck*.—This is a timber tree not mentioned by Mr. Masters (neither is the last named); the Huluck however is one of the finest forest trees we have, and is a timber much esteemed by the natives of Upper Assam, and probably two-thirds of the canoes of Upper Assam are formed from it, arising probably from the fact of the Huluck being found plentifully distributed in accessible localities on the banks of rivers and hill streams.

It is very common in the forests of Muttock, on the banks of the Tingri at Kato barree, on the banks of the Dehing and Namsang in the southern Hills, and also on the banks of the Dehong river, and next to the Mekai and Hoolung is the most plentifully distributed tree we have.

It is distinguished by its fawn-colored bark, tall stem, and light green leaf, the branchy top of the tree spreading to a great extent. The Huluck seems to occupy the flats in the different beds of the hill streams, and is thus more accessible to the boat cutters.

No. 28.—A species of Willow,⁽¹⁾ common in the Soonderbunds. I have seen no wood better adapted for weatherboarding or beams, and other timbers for thatched roofs.

The Bhé grows in low grounds in Upper Assam near the beds of rivers, and on the edge of *Pathers*,⁽²⁾ and

(1) This willow is met with in Lower Assam, but is not common.—F. J.

(2) Rice plains.—F. J.

Jeels ; it attains a considerable size in the jungles about Jackerah.

No. 29.—This is a timber tree which is noted as strong and durable, and well adapted for boats ; it is common in the plains about this station, and some trees of a magnificent size are to be seen in the Tipam Tea Barea.

No. 30.—A tree found in Upper Assam, and is associated here with the *Amrah* and Am Seia, a black varnish tree, all of the same species.⁽¹⁾

No. 31.—This is a timber well known at Dacca, and is admirably adapted for that portion of boats under the water ; well seasoned it is a good wood, and considered equal to the Tehaum, and for boats probably better. There are two kinds, one of a small growth, which is to be found on the banks of ditches.

The *Jarool* is very common, and is associated with the *Gorah* or Assam teak, on the banks of the Dekho and Disang rivers in the vicinity of the Burampooter ; the flowers of this tree in the month of June are very beautiful.

No. 32.—This is merely given as a sample of a very close-grained, white, light wood, common in Upper Assam, being a very pretty tree with bunches of white flowers. The seeds when ripe are worn by the natives, and called Bamruttee, and is probably a *Monocera*. The leaves of this tree are used as a fast dye of a yellow colour to cotton, before using Munjeet.

No. 33.—An exceedingly hard and durable timber, and I believe the whole of this genus are so ; the heart-wood is nearly as hard as *Lignum Vitæ*. The tree is common in all our Upper Assam jungles. •

No. 34.—There are several kinds of this tree, which, although a short grained, brittle wood, stands well when cut at a proper time and seasoned. There are trees in this neighbour-

(1) *Order* : but this is incorrect, the *Spondias* (*Amrah*) being of a very distinct order.—F. J.

hood which have been cut for some years, and have been exposed to all weathers, yet are perfectly sound ; this timber is well adapted for chockals, or for any work in chopper roofed houses.

From this tree a clear red colored gum¹ exudes like kino, and from the bark by boiling with water, an astringent and sweetish extract is obtained which hardens ; the natives also employ the leaf with iron in dyeing a black color. The berries or fruit are very glutinous, and answer to a certain extent the same purpose as *gab*. The charcoal of the Uriam is esteemed by blacksmiths.

The Uriam is common in all our jungles in the plains of Upper Assam.

No. 35.—This is called by the natives Amaree, and often Amaree Poma, and is decidedly, from the similarity of the leaf, bark and fruit, a species of toon ; it appears to me to be equal to many of the Mahoganies we see in common furniture ; it is considered in Assam a strong durable timber ; there are two kinds, the red and the white. Very fine trees of this timber are to be found in the neighbouring hills, and some no doubt beautifully veined.

No. 36.⁽¹⁾—There is no tree we have in Assam, which after proper seasoning appears more durable than the “Sassafras ;” boats of great size formed of this timber are yearly brought down the Dihong river, and are greatly prized ; some very fine timbers are found on the sands of the Burampooter, at the close of the rains, and it is probably a forest tree on the base of the northern mountains. It is a very common tree in this neighbourhood. The specimen now sent is a portion of a very fine tree, which grew within 50 yards of the parade of the Light Infantry, as well as that of the Heeluka and Medala ; in fact, this spot was covered with a variety of fine

(1) From seeds of this tree Dr. O'Shaughnessy extracted an oil in all respects the same as the Sassafras oil of commerce ; the oil can also be readily extracted from the roots.—F. J.

forest trees this time last year. The smell of Sassafras is very strong so long as the tree remains moist; the Assamese however do not seem to know that the wood contains an oil, which has medicinal properties.

No. 37.⁽¹⁾—This is one of the gum resin trees, but of what denomination I know not. The tree was cut in the plains within the station, but it attains to a size equal to the Mekai on the hills. The shell containing the seeds when dry are hard and three-celled, and pointed at both ends about $1\frac{1}{2}$ inch long, and when fresh from the tree they are covered with flesh of a green color, which has an agreeable fragrant smell, and so has the wood when newly cut. The gum resin, of a light amber color, exudes spontaneously, but by cutting the bark it comes in greater quantities and falls down to the foot of the tree, where it is collected frequently mixed with earth, according to the time which it has been thus accumulating.

The Chinese here recognise the Neribee as common in China, and say the fruit is eaten there, and that the seeds rubbed down with water are applied to sores and wounds of the skin.

No. 38.—This is given only as a sample of a tree rather common in the jungles here, and called Tez Kat, or blood tree, from the circumstance of a juice, the color of blood, exuding from the bark when cut with a *dha*.

Having now ended my account of the trees furnishing the samples now sent, I think it necessary to add, that there are perhaps as many more, some of them also useful as timber, which might be collected; but the season for collecting having passed away, you must be content with those I have sent for the present, and as far as I can recollect, samples of the most useful trees, I mean those which are best adapted for building purposes, have been forwarded. I will now conclude by stating what little I know about the probability of obtaining

(1) Capt. Hannay in a subsequent note gave to this tree the name of *Canarium strictum*, having, he said, fully identified the tree.—F. J.

the best and largest timber for exportation, it is however thus far only I can offer an opinion ; as to calculating the probable profits which might arise from a speculation in Assam timber, this can alone be done by the practical dealer in timber. I will only venture to say, that if good, sound, and suitable timber reached any of the wood marts of Bengal or Calcutta, it would in all probability find a ready sale ; much would I dare say depend upon the description, whether in board, thick planks, beams or rough logs ; and in this respect a great deal could be effected with the aid of saw-mills, near the principal forests ; and for my part, as far as a wish to see the timber resources of the province went, I have ever regretted that the mill which was sent up to Jeypore by the ⁽¹⁾Assam Company was not put up instead of lying here rotting ; a memento of bad management or incapacity somewhere : a commencement might have been made at all events, and the possibility and expence of bringing down large timbers by means of the hill streams and assistance of the hill tribes, would have been tested.

If one go back to the palmy days of Assam, when the population of the upper portion of the valley was much more dense than at present, and the Ahom dynasty of kings reigned in all the semi-barbarous pomp and pageantry peculiar to Indo-Chinese nations, war canoes and canoe fashioned boats of all kinds were common, and as the bulk of the people lived in Mué-chang houses like the Burmese, we may

(1) It was not put up, I understand from the Superintendent, on the part of the A. Company having reported that there was no fitting timber for Tea boxes and the other purposes of the Company, to be procured, and little of any timber whatsoever. Captain Hannay's present memoir will sufficiently show that this report was founded on bad information. Whether it was good policy in the first instance to send up a saw-mill to Jaipur may be a doubtful question, but it seems a most unfortunate economy, that after the mill was purchased and transported so far, that it should not have been put together and set to work, especially as it might have been erected within 200 yards of a mine of excellent coal, and immediately on the banks of the Booree Dehing River, which would have brought down all the timber.—F. J.

suppose that timber was invaluable to the country generally, and no doubt boat cutting, and cutting and rafting of timber was as well understood as it now is in Burmah. With the present generation in Assam, according to the classification of the different trades and occupations of the Ahom Khels,* we have of course the descendants of the royal boat cutters and others, whose business it was to supply timber to the state; but with the lapse and changes of years, their handicraft has disappeared, and boat cutting is now confined to a few idlers who live in the vicinity of the timber forests of the Dhunseeree, some of the Beheiahs, and Merees of the upper Burampooter, and a village or two of Abors of the Dihong, residing nearest the river and the bed of the Burampooter. The knowledge of floating and rafting has probably disappeared altogether.

I will now conclude this rather lengthy paper with merely stating in regard to our north bank Burampooter timber localities within the Dihong and other tributary hill streams, that if a few individuals with very rude implements can bring into the Burampooter yearly from 50 to 100 boats of 50 to 150 maunds burthen, formed of valuable woods, such as toons sassafras, teham and huluck, I do not apprehend any difficulty in making a contract with these people for a supply of timber of different kinds, and I dare say they have tact enough to be able to float it down the Burampooter to the Dhunseeree, where by means of a saw-mill it could be cut up, and despatched in the form best suited for the markets of Bengal, or for transit by boat or otherwise.

On the south bank of the Burampooter, in the Jorehauth district, much could be effected, the hill streams being numerous, and the population on both the plains and hills comparatively dense; within the Dhunseeree river, indeed, I would say, a contract for timber might be very easily effected

* Khel, clan, of the same trade or occupation.—F. J.

with the people of the Morung, who yearly frequent the forests to cut timber for boats.

The greatest difficulties appear to exist in the eastern parts of the Jorehauth district, round Jeypore and the upper Dihing, from the want of Assamese population, and the deserted state of the country in consequence of former Singpho and Burmese aggression ; a great change however having taken place, and the fears of the people being almost entirely dissipated as to foreign invasion, I do not see why, with the assistance of the Nagas, who are famous tree-fellers, the magnificent timber of the lower ranges should not be brought down into the plains by means of the several hill streams falling into the Disang and Dihing rivers ; money, management with the hill people, and a demand for timber would in fact overcome all difficulties of transit in the hills, where we see that noble and excellent timbers are growing on the slopes of hills of moderate ascent, at the base of which run rivers of considerable size.

I may here mention the Taorak and Dillee (the two principal branches of the Disang) the Namsang and Majador and even the Dihing itself ; a little practice would soon make the Nagas perfect in this kind of work, and once in the Disang and Dihing, these timbers could be easily rafted and carried down to the Dhunseree.

Yours, &c.

S. F. HANNAY.

NOTE.—I should like to have been able to add to this paper some account of the timbers of Lower Assam, but I have not the means at present. But I may refer to Dr. Buchanan's Catalogue of Indian woods, which was published in the 48th vol. of the Transactions of the Society of Arts. Upwards of 80 of the woods enumerated in that Catalogue, were collected by Dr. Buchanan at Goalparah and in that neighbourhood, and it would be desirable, I think, if that Catalogue, corrected if possible to the present period, were republished in the Transactions of the Agricultural Society, for more general information.

The timber trade in the Goalparah Division is extensive, and chiefly consists in the export of saul timbers, from the estate of Purbutjoar on the North bank, and the Garrow range of hills on the South bank, to the great building marts in lower Bengal.—F. J.

List of Timber trees referred to in the Memoir.

No. 1. Nahor,	Mesua ferrea.
„ 2. Jutelee,	Lequidamber.
„ 3. Mekai,	Dipterocarpus.
„ 4. Hoolung,	Ditto.
„ 5. Tehaum,	Artocarpus Chaplasha.
„ 6. Joba Hingooree,	Quercus.
„ 7. Kanta Hingooree,	Castanea species.
„ 8. Bor Hingooree,	Ditto.
„ 9. Tita Sopa,	Michelia.
„ 10. Kureeka Sopa,	Ditto.
„ 11. Gowreea Sopa,	Ditto.
„ 12. Fool Sopa,	Ditto Champaca.
„ 13. Heleeka,	Terminalia citrina, Roxb.
„ 14. Bor Bola,	Ditto.
„ 15. Heela Bola,	Ditto.
„ 16. Hindooree Poma,	Cedrela Toona.
„ 17. Ditto,	Ditto.
„ 18. Seekha Poma,	Ditto.
„ 19. Sisso,	Dalbergia.
„ 20. Koroï,	Acacia.
„ 21. Medala,	Ditto.
„ 22. Moj,	Inga bigemina, Willd.
„ 23. Bor Jamoon,	Syzygium.
„ 24. Boga Jamoon,	Ditto.
„ 25. Nohor putteah Ja- moon,	Ditto.
„ 26. Ghorah,	Teak species.
„ 27. Hûlûck,	×
„ 28. Bhé,	Salix tetrasperma.
„ 29. Naga Bhé,	Gordonia integrifolia.
„ 30. Bon Am,	Mangifera sylvatica.
„ 31. Jarool, or Ajor,	Lagerstrœmia Reginæ.
„ 32. Bhom ruttee,	×

No. 33. Parolee,	<i>Bignonia chelenoides.</i>
„ 34. Uriam,	<i>Andrachne trifoliata.</i>
„ 35. Amaree,	<i>Poma</i> , or <i>Toon</i> species.
„ 36. Gond Khoroi,	<i>Laurus Sassafras.</i>
„ 37. Neribee,	Gum Resin Tree (<i>Canarium strictum</i> ?)
„ 38. Tez Khat,	Blood Tree.

S. F. HANNAY.

Note on the Cotton of the Chittagong District. By A. SCONCE, ESQ., Bengal Civil Service.

From an early period,—for the last seventy years, and I know not how long before,—cotton has been an established product of this district. In the earlier times it consisted, generally speaking, of two sorts; that grown in the frontier hills, and that grown in the plains. The latter sort would appear to have been encouraged by the local demand, arising from the manufacture of cotton stuffs in the Government Factory; but since this was abolished, the cultivation of cotton in the interior of the district seems to have been discontinued; at all events the quantity now grown is very limited: and the hill cotton only, from the extent to which it is cultivated, and the trade which it fosters, is worthy of notice.

Cotton is the grand staple of the Joomeas, or hill-people, throughout the extent of our long frontier; from the river Fenny which separates Chittagong from Tipperah, down to Teknaaf, the Arracan border. They are but rude farmers. A hill side is cleared from the surface wood; the land is neither ploughed nor dug, and with the commencement of the first rains, the seed is sown. Rice, gourds, pepper, cotton, are all dropped in the same hole. First ripened, is first reaped. The cotton is gathered in the months of October, November, and December. The same hill is used only for two or three years; when it is abandoned and a new clearance made.

I subjoin an estimate of the quantity of cotton grown during the last two years, giving also the localities, though perhaps it might be sufficient to state the gross result:—

	Crop of 1844-45.	Price.	Crop of 1843-44.	Price.
Futikcherree, ..	8,000 maunds,	2-8	10,000 maunds,	2-0
Runguneah, ..	15,384 „	3-4	22,222 „	2-4
Sutkuneah, ..	14,285 „	3-8	22,222 „	2-4
Chukerea, ..	14,000 „	2-8	15,555 „	2-4
Ramoo, ..	8,333 „	3-0	11,111 „	2-4
Teknaaf, ..	10,000 „	2-8	12,500 „	2-0
	<hr/> 70,002		<hr/> 93,610	

This estimate is based not upon a calculation of the lands cultivated or the cotton picked (which under general circumstances is impossible), but upon the traffic, after it has left the hands of the Joomeas, and the capital turned over by the dealers interested in the trade.

The estimate is made of the uncleaned cotton; commonly two-thirds go to seed, and one-third is yielded of clean cotton or *rooe*: but in some sites, chiefly I am informed where the soil is better, the cotton is not only of a better quality, but the bulk and weight of seeds diminish, while the clean cotton increases. In Sutkuneah as much as two-fifths of clean cotton is picked. I observe from specimens now before me, that the staple of the Sutkuneah cotton is finer and longer; but as I have said this is ascribed to the soil, and not to a variety of the plant.

There are always two, often three parties engaged in the transport and purchase of the cotton between the cultivators and its final export from the district. Beoparees from the plains go into the hills to purchase it, either as agents or as principals. It is then stored in *golahs*; and from these *golahs* it is bought by *outside* merchants, residing at Naraingunj (Dacca,) or other towns in eastern Bengal.

The prices which I have given above are the average of the first purchase made by the Beoparees: between them and the Joomeas others often intervene, and of course intercept

a portion of the profit. In re-selling the cotton for export the Beoparees make at least one rupee per maund. This year in Sutkuneah the Aurung or Golah price is Rs. 5-8; which is an advance of two rupees above the prime cost. But it is not in this only that the profit of the *home* merchant consists. The Joomeas, however crafty in matters within their own cognizance and under their own controul, are beaten in barter. It is not to be supposed but that they got the worth of their goods, but they got less than what a knowledge of the weights and prices of the plains would enable them to secure. Rude scales are used and heavy weights, 50 or 60 seers to the maund.

Besides the cotton carried out of the district, to which my estimate is chiefly confined, a good deal is left for home consumption. Perhaps the ordinary crop of the district may be expressed at 75,000 maunds seed cotton, or 25,000 maunds cleaned cotton: this would be two millions of pounds.

To the home dealer the purchase of cotton involves an outlay of about Rs. 2,00,000; to the exporters, about Rs. 3,00,000, but much of these sums may be supposed to be one capital, twice used.

At the rate of Rs. 2-8 a maund per seed cotton, the equivalent price in English money would be $2\frac{1}{2}d$ the pound; one maund of seed cotton would give, say, $12\frac{1}{2}$ seers, or 25 lbs. *rooe* for Rs. 2-8, say 5 shillings; i. e. 5 lbs. to the shilling. This may be taken with sufficient accuracy to shew at what price the cultivators can afford to grow the staple. Some years back much higher prices ruled; the fall is said to be owing to the greater importation and use among native weavers, of English thread. But even now the common retail price of cotton, current in a country where the staple is indigenous, compared with prices in England, seems extremely high. In the Bazars here it sells at 3 seers to the rupee, or 4 annas the pound.

Chittagong, 31st March, 1845.

*A few hints to Plant Collectors, by Mr. ROBERT ROSS,
Head Gardener, H. C. Botanic Garden, Calcutta.*

[*Note from Dr. Wallich to the Secretary.* I think there are some good hints in the accompanying paper, for Plant Collectors; and I send it to you at the request of its author, Mr. Ross, for insertion in the Agricultural Society's Journal, should you agree in opinion with me as to the merits of the paper.]

The following hints to seed collectors, for this or any other Botanic Garden in India or any hot climate, the result of my own experience in Western Australia, may not be out of place as a sequel to my paper "On the best mode of propagating plants in India," published in the third volume of the Society's Journal, as they are calculated to provide, under certain circumstances, a substitute for Seeds themselves.

Every seed collector knows what trouble and fatigue he must undergo in travelling through the bush or jungle, collecting seeds of the choice plants he may meet with on his way. He sees the plants in flower, and travels many miles to and fro, watching the ripening of the seeds, and after all, perhaps, he is doomed to be disappointed, as many plants, even in their native clime, do not produce seeds every year alike. It is well known some fruit trees do not produce a crop of fruit alike every year; some years they have none or next to none, and some years they have more than enough. I say more than enough, for how often may fruit trees be seen dropping one-third, or more, of their fruit before they are half ripe.

To save the collectors trouble, time, and expense, cuttings might be taken from many of the choice specimens he may meet with, and heeled in a box with about 8 inches of moist friable mould, which he is supposed to carry with him for the purpose. This box might be carried on a bamboo between two or more coolies. One box will hold a good many cuttings of various species, say twenty or so of

each ; a box three feet long, eighteen inches wide and eighteen inches deep, will hold several hundred cuttings ; and cuttings heeled in, in this way, so as not to be too much crowded, will keep fresh for several days, provided they are shaded from the sun. And if they should be found sickly on their arrival at their destination, they will soon recover after being planted under glasses in the sand bed.*

This plan of propagation is only meant for a circuit of three or four days' journey, or twenty or thirty miles in behalf of some botanic or other garden, public or private, which it is desired should be stocked with plants at the least possible expense ; and by this plan, there is no waiting for seed to ripen. Cuttings in this climate can be had at any season from most plants, but the operator must understand how to make and select such as will answer. This mode of propagation may appear a strange round-about way to some, but had I not experienced the utility of such a mode myself, I would not attempt to urge its advantages. In a climate like Swan River, a European can expose himself travelling in the bush any day in the year without experiencing any bad effects from the heat of the sun ; but in this country one could not do so, from the deadly nature of the climate : therefore such labour must be done most of the year by natives, or those born in, and inured to, the climate.

*Hon. C. Bot. Garden,
Calcutta, April 22nd, 1845.*

* See a paper in the third volume of the Society's Journal, on the propagation of plants from cuttings in sand beds.

On the mode of cultivating and preparing Cacao in the West Indies. By MR. A. L. HARRIS.

To the President of the Agricultural Society, Calcutta.

HONORABLE SIR,—Having been informed by a friend lately arrived from Calcutta, that an essay on the growth and culture of the Cacao tree would be acceptable to the Agricultural community, I am induced to take the liberty of laying before you the subjoined brief history of its cultivation and preparation for shipment. There are few, and perhaps no Agricultural or Horticultural pursuits, so delightful as that of the cultivation of the cacao; the sight of its bright foliage, rich in color, varying from light green to a dark red, loaded with yellow and dark red pods, which contain the chocolate bean, are beautiful objects; these are shaded by the “Bois immortel” or the “Erythrina umbrosa” of botanists: (like the “Bignonia” or “Pouie”), this tree at particular seasons throws off its foliage, and is covered with blossoms; those of the Erythrina are of a brilliant red color, justifying its Greek appellation. In this state they are literally dazzling to behold; no objects in the vegetable world look more striking than the alleys of a cacao walk, shaded by a forest above them of the “Bois immortel.”

ON THE CULTURE.

Firstly, a nursery is formed, which is a piece of moist land picked out and well cleared of the weeds; this done, the seeds are sowed regularly and in such a manner, so as to contain the quantity of trees required, or even more, the surplus being for supplies; they are then to be covered over with plantain leaves, and allowed to remain so for a few days, till they begin to appear or come forth; then the plantain leaves are to be removed, in order to allow the cacao trees to spring up well: when they arrive to the height of

from 12 to 18 inches, they are then fit for transplanting; great care must be taken to remove them with a shovel, in order that the soil may not be broken from the capillary roots.

TO FORM A CACAO ESTATE.

It is essential that the land is very good, flat, and if possible close to streams of water; as soon as the land is cleared and burned, the same is then planted with "Shade" first, that is to say, with trees called by the French, "Bois Immortel" and by the Spaniards, "Anancos," or "Madre de Cacao," (mother of Cacao,) it being a tree that grows to a very great height and bears a red pea, at the same time affording the best of shade, cacao requiring the same; they are planted at right angles, and at about from 30 to 40 feet apart; this done, the small cacao trees are then put in, (after the ground has been perfectly lined,) and planted in rows, of from 12 to 15 feet apart. Coffee, plantains, and manioc are also planted among them, to afford a perfect shade, till the "Immortel" is able to afford a necessary shade itself, then the plantains and manioc are dispensed with, the coffee being left.

As soon as the cacao attains its third year, provisions are no more planted among them, as the trees will then require air; the coffee trees are to be planted so as not to grow higher than four feet, which will enable them to bear the more.

Cacao begins to bear the fourth year, but when it arrives at its seventh year it is then at its full strength and bearing; three English acres of land ought to contain 900 cacao trees, not more.

A cacao estate is weeded twice a year, June and December, with a cutlass; there are two crops of cacao in a year, June and December, the latter is considered the best; but there are what the Spaniards call "Robusco" or small pickings, all the year round.

MODE OF PREPARING.

As soon as the cacao, which grows in large pods, is ripe, the men are put to pick it; this is done by a pole of 3 inches diameter, at the end of which a cacao knife is attached. The cacao as it falls on the ground, is gathered by the women and children who follow picking it up in baskets, and piling: when it is all picked and put in one large pile, task work is given, which is, each person is to scrape the beans clean out of the pods. When it is once scraped clean out it is conveyed to the *swet house*, where it remains three or four days, according to the color required; at the end of this period it is put out in the sun in a house made for the purpose, being 50 or 60 feet long and 18 feet wide, the roof of which moves on wheels; once in the house, one person is sufficient to mind it, it requires three days in a good sun to dry it, after then it is fit for immediate use, it is then put into bags for shipment.

Fifteen to twenty laborers are sufficient for an estate of 30,000 to 40,000 trees, which quantity of trees will give annually from 800 to 900 bazar maunds of cacao, and the expenses for carrying on such an estate would be from 2,000 to 2,400 Rs. per annum, including every thing.

The establishment of a cacao estate, or rather works, are but few and simple, and require very little outlay, being only a curing or swet house, a store, a cacao house for drying, and four or five head of cattle. The profit derived from a cacao estate is not as much as from a sugar estate, but gives a fair remuneration, and free from all accidents, as even fire will do it no harm, for should the trees burn, the same will spring forth afresh; thus there is neither the anxiety nor the outlay experienced as in sugar.

With the hope that the foregoing details may prove serviceable,

I am, &c.

A. L. HARRIS.

P. S.—Coffee is almost always grown among the cacao trees in the West Indies and Spanish Main, as it assists to shade the cacao at first, and it would be considered very unprofitable to remove them at their maturity.

A. L. H.

London, 18th April, 1845.

Further remarks on certain varieties of Sugar-cane. By J. V. THOMPSON, Esq., M.D. Deputy Inspector General of Hospitals at Sydney.

DEAR SIR,—In fulfilment of my promise to Dr. Spry of sending a further communication on the subject of Sugar-cane, I have now the pleasure of making good my promise.

In my former paper on this subject,* I brought forward proofs from Mons. Cossigny's work "*Ameliorations des Colonies*," that the cane now principally cultivated in the Mauritius is not the *Otaheitean* but the *Batavian*, "*Cannes blanches*" of that gentleman, which he introduced together with the other *Batavian* canes direct from Java in 1782, and not only distributed the *Cannes blanches*, (rather *jaunes*) to Bourbon, but sent them to Cayenne, Martinique, and Saint Domingo in 1788 and 1789.

Having since directed my attention more particularly to the subject of the Mauritius canes, I find that when the French were expelled from Madagascar by the natives in 1657, they are stated to have carried with them to Bourbon, where they first established themselves, the Sugar-canes of Madagascar, which was probably one or other of the two yellow varieties which stand at the head of the appended list; from Bourbon the French subsequently removed to the Mauritius, of which they possessed themselves in 1715,

* This paper is published in the first volume of the Journal.—*Eds.*

so that the Madagascar canes became in all probability the general stock of the two Islands. I feel quite satisfied that with such fine canes the French would give themselves no trouble to introduce others from so great distance as Otaheite.

The two kinds at present cultivated there, *viz.*, the Madagascar and the Batavian yellow cane, although probably so much alike as to lead to their being confounded together, have no doubt characters sufficient to distinguish them from each other, which any intelligent member of the Society can now do, as they have been abundantly introduced from both the Mauritius and Bourbon, and cultivated to a considerable extent in the Society's Nursery grounds for many years, under the appellation of Mauritius, Bourbon and Otaheite cane. They may now be further compared with the genuine Otaheite cane, which was successfully introduced from that Island several years ago. Subsequently I also received a box of canes from Otaheite, which I am happy to say are doing well, and consist of four different varieties, *viz* :

1. A large pale yellow cane, (Cannes blanches ?)
2. A large purple cane.
3. A large reddish yellow cane.
4. A good sized striped cane.

I have received canes of the same description from Batavia, but I entertain doubts of their identity with the Otaheitean canes, or with any of the Madagascar canes of the unmixed list.

Independent of the canes introduced by the French into their islands originally, there exist in the great island of Madagascar a very considerable number of other fine varieties of the Sugar-cane, many of them very remarkable for their size and beauty, and of all which the natives appear to know the respective qualities irrespective of sugar making; as they appear to differ much in precosity, product, sweet-

ness, hardness, &c. &c. some being best grown on the alluvial banks of the rivers, others on the drier slopes of the mountains, others again in the wet and swampy flats. As the cane is only grown by the natives of Madagascar for eating and for making intoxicating drinks by fermentation or distillation, and consequently not upon any great or extended scale, it is most probable that the various kinds originate in seminal varieties naturally produced, from many of the plants being neglected and allowed to run to seed.

While Government Agent at Madagascar from 1813 to 1816, I was instructed to collect and forward to the Botanic Garden at the Mauritius, all the varieties of Sugar-cane I could obtain in duplicate, of which the appended is a detailed list of those so procured, which I succeeded in conveying safely, and delivering in a healthy and growing state in 1815, to the Superintendent of the Mauritius Garden at Pamplémouse. As I left the Island in 1816, I am unable to state the fate of these kinds, but suspect their value not being appreciated, they attracted little attention, and have probably been dispersed or lost.

I am, dear Sir, very faithfully yours,

J. V. THOMPSON,

Deputy Inspector Genl. Hospitals.

Sydney, Jan. 18th, 1845.

List of Sugar-canes introduced into Mauritius from Madagascar in 1816, alluded to in the preceding paper.

A. Yellow canes.

No. 1. * Fary-baymayvow (large yellow, Malg.) a large yellowish cane, probably identical with the original Mauritius and Bourbon cane.

* Fary is the Malgache generic name of the Sugar-cane, to which they join a distinctive appellation descriptive of size, colour, &c.

No. 2. Fary-andrafow, a moderate sized cane, of a pale yellowish colour.

No. 3. Fary-carowk, a moderate sized cane, of a beautiful bright orange colour when ripe, so called from its colour resembling that of the beak of the little ground-parrot.

No. 4. Fary-boubaya, of a moderate size and of a yellowish colour, slightly tinged with red. N. B. Like one of my Otaheite canes.

No. 5. Fary-boubaya mayna, a variety of the above, more deeply tinged and with a brighter red. (Mayna red, Malg.)

No. 6. Fary-Vonlon (Malgache name of bamboo) extremely large, with long joints, and of a greenish yellow colour, 3 inches in diameter!!

B. Red or Purple canes.

No. 7. Fary-Carang (Prawn coloured), a large cane, of red colour above, and of a dark reddish purple towards the root, so called from its predominating colour being like that of the boiled shrimp.

No. 8. Fary-androfow mayna (red andrayfow, Malg.) a red variety of No. 1 by its Malgache name, which I doubt, and consider it a distinct variety, is only of a moderate size, with long joints of a purplish red colour, deeper towards the root.

No. 9. Fray-maëntee (black-coloured, Malg.) a large cane, of a very deep reddish purple colour. N. B. Resembles the purple Batavian and Otaheitean canes.

C. Striped canes.

No. 10. Fary—(distinguishing name obliterated in my manuscript,) a large cane, with reddish purple stripes on a dark purple ground.

No. 11. Fary-ahombeé (Bullock's-horn, Malg.) a very large cane, next in point of size to No. 6, Bamboo cane, both in size and marks, resembling a bullock's horn, colour mixed stripes and shades of a yellowish and reddish purple.

No. 12. Fary-mang-indavolan, or Fary-Ginghan (Ginghan cane,) rather a large cane, of a dark reddish purple below and striped above, with a yellowish red on a bright reddish purple ground.

No. 13. Fary-Feesweet (Comb-striped, Malg.) of a moderate size, more closely and regularly striped, with a yellowish and a purplish red colour.

There are doubtless many more varieties of which I saw two or three, but did not procure sets, being *en route* at the time of their offering themselves to my notice.

J. V. THOMPSON.

On a method of ascertaining the amount of Crystallizable Sugar in Khar or Muscovado. By J. W. LAIDLAY, Esq.

The great extension of the sugar manufacture in this country having induced many persons to engage in the purchase of the raw material or *Khar*, whose practical experience of its value is very limited, I have been led to think that the following ready and convenient method of ascertaining the amount of crystallizable sugar in the unrefined material, could not fail to be useful in assisting their labours. There are indeed chemical means of ascertaining this point with much greater certainty and precision; but these are too operose for most people, and would consume more time than the man of business, even if skilled in manipulation, could very well spare; objections which do not accompany the method now under consideration.

Its principle is this: if a given weight of pure sugar be dissolved in an equal weight of water, a solution will be obtained whose specific gravity will be 1.2299 at 84° Fahren-

heit. But if, for the sugar, an equal weight of molasses be substituted, the solution will have a specific gravity of only 1.165, or thereabouts. Now any admixture of these substances, as in Khar, will produce a solution, whose density will be intermediate, being greater or less according as the sugar or the molasses predominates; and all that is necessary to determine their relative proportions is a table founded upon a sufficient number of exact experiments, showing the density of such solutions of sugar and molasses in every necessary proportion.

The principle is obvious enough. It may be objected however, that though this method will indicate with sufficient nicety the proportions of sugar and molasses where these exist in a state of purity, yet there are frequently foreign substances present in *Khar* which greatly affect its value, such as sand or dirt, fraudulently added to increase the weight. This is quite true; but as such adulterations are for the most part insoluble, they fall to the bottom, or may be separated by filtration, and thus the density of the solution is diminished; so that they by no means escape detection by this test.

In drawing up the subjoined table it was necessary in the first place to determine the average or normal condition of sugar and molasses. In regard to the former, there was no difficulty; good London loaf sugar may be taken as an unexceptionable standard. That which I used when thoroughly dried by long exposure to a current of air heated to 120° Fah. gave with an equal weight of water a perfectly colourless and limpid solution, whose specific gravity was 1.2299 at 84° Fah. corresponding precisely with Dr. Ure's determination, of the density of such a syrup, 1.2310 at 60° Fah. But with regard to molasses, a fluid extremely sensible of hygrometric changes, it is not so easy to determine its average condition. From a number of experiments, I think the medium density

is about 1.37 to 1.38. Some molasses of this strength exposed to an atmosphere saturated with humidity, fell in a week to 1.36, at which strength there was manifested a strong disposition to fermentation; a further exposure for a week reduced it to 1.31, when an active fermentation ensued, and the attenuation proceeded rapidly in a few days to 1.289. It may be assumed therefore, that molasses cannot be kept much below 1.36 without a tendency to decomposition.

One hundred grains of the same molasses (sp. gr. 1.37) were dried over sulphuric acid at the ordinary temperature and pressure. It thus became very thick, and lost 11.8 grs. On again exposing this to the air, it regained its original weight in less than twenty-four hours, although the day was a sunny and dry one. I think therefore, that I am not far wrong in assuming the average specific gravity of molasses at 1.37 to 1.38: that which I used in framing the subjoined table had a density of 1.3740, and formed with an equal weight of water a solution whose specific gravity was 1.1656.

Having explained the principle, it now only remains to describe the mode of applying it in practice. For this purpose are required a small set of scales and weights, and a stoppered phial containing from 500 to 1000 grains of water when the stopper is in its place. Having ascertained exactly the weight of water the phial will contain, weigh an equal amount of the Khar, and dissolve it (in a somewhat larger bottle) in a measure of water from the stoppered phial; fill the latter and weigh, when the weight of the solution divided by the weight of pure water which the phial will contain, will give the specific gravity. On referring to the following table the per centage of sugar corresponding with the specific gravity will be found, and will not in general differ very much from the truth.

Sugar.	Molasses.	Specific gravity.	Sugar.	Molasses.	Specific gravity.
100	0	1.2290	74	26	1.2129
99	1	1.2292	73	27	1.2122
98	2	1.2285	72	28	1.2116
97	3	1.2279	71	29	1.2109
96	4	1.2272	70	30	1.2103
95	5	1.2266	69	31	1.2096
94	6	1.2259	68	32	1.2090
93	7	1.2253	67	33	1.2083
92	8	1.2246	66	34	1.2077
91	9	1.2240	65	35	1.2070
90	10	1.2233	64	36	1.2063
89	11	1.2227	63	37	1.2057
88	12	1.2220	62	38	1.2050
87	13	1.2214	61	39	1.2044
86	14	1.2207	60	40	1.2037
85	15	1.2201	59	41	1.2031
84	16	1.2194	58	42	1.2024
83	17	1.2188	57	43	1.2018
82	18	1.2181	56	44	1.2011
81	19	1.2174	55	45	1.2005
80	20	1.2168	54	46	1.1998
79	21	1.2161	53	47	1.1991
78	22	1.2155	52	48	1.1985
77	23	1.2148	51	49	1.1978
76	24	1.2142	50	50	1.1972
75	25	1.2135			

The reader must be apprised, however, that the foregoing table refers only to Muscovado, and not to *Dulcoa*, or Khar which has undergone an operation analogous to claying. The reason of this is obvious: the molasses is removed by this process, and a portion of water occupies its place; and the latter being a lighter substance, will reduce the specific gravity of the solution, and so give rise to considerable error. For the same reason Khar that from exposure to excessive humidity has parted with its molasses, and diliquesced, cannot be valued in this way, as the amount of sugar indicated will be too small. The following table, showing the effect of hygrometric moisture in reducing the density of solutions of sugar and water in equal proportions,

may not be altogether useless in a climate subject to such extremes as that of Bengal.

Hygrometric water.	Sugar.		Hygrometric water.	Sugar.	
0	100	1.2299	6	94	1.2128
1	99	1.2271	7	93	1.2099
2	98	1.2242	8	92	1.2071
3	97	1.2214	9	91	1.2042
4	96	1.2185	10	90	1.2014
5	95	1.2156			

Further Correspondence connected with the experimental Cotton cultivation in the District of Dacca.

(Communicated by the Government of Bengal.)

From the Under Secretary to the Government of Bengal, to JAMES HUME, Esq. Honorary Secretary, Agricultural and Horticultural Society.

SIR,—In continuation of my former letters on the subject of the experimental cotton cultivation in Dacca, I have the honor to forward a box containing sundry parcels of cotton

To Secretary Sudder Board of Revenue, No. 877, 16th October.

From ditto, No. 406, 14th October, with enclosure.

From Commissioner of Dacca, No. 378, 11th October, with enclosure.

To Secretary Government, Fort St. George, No. 256, 23rd October.

From Commissioner of Dacca, No. 39, 4th Nov. with enclosure.

To Secretary Sudder Board of Revenue.
To Governor General's Agent.

} this
date.

which has been recently sent down by Mr. Price, and which the Society are requested to examine and report upon.

2. I have also the honor to annex further correspondence on the subject.*

I have, &c.

C. BEADON,

Under Secy. to the Govt. of Bengal.

Fort William, 20th Nov. 1844.

* These specimens and papers were transferred to a competent party to examine and report on, but were unfortunately lost or mislaid before a report was prepared. This will account for the delay in the publication of the correspondence, of which duplicate copies have been recently furnished by Government.—EDS.

No. 877.

*From the Under Secretary to the Government of Bengal, to the Officiating Secretary to the Sudder Board of Revenue.**

SIR,—In continuance of my letter, No. 643, dated the 5th August last, I am directed to request that with the Board's permission you will intimate without delay to the Commissioner of Dacca, that the instruments mentioned in the list which accompanied Mr. Price's letter of the 21st June, (with the exception of the Saw Gin and Screw Press,) will be despatched in a few days by boat to his address at Dacca.

2. An application has been made to the Government of the North Western Provinces for such implements and machinery for the culture and preparation of cotton, as are not required in those Provinces; and it is considered not improbable, that a Gin and Screw Press may be spared for Mr. Price's use.

I have, &c.

(Signed) C. BEADON,

Under Secy. to Govt. of Bengal.

Fort William, 16th Oct. 1844.

No. 406.

From the Officiating Secretary to the Sudder Board of Revenue, to F. J. HALLIDAY, Esq. Secretary to the Government of Bengal, Revenue Department.

SIR,—I am directed by the Sudder Board of Revenue
 Mis. Dept. Present to submit herewith, in original, for the pe-
 J. Patile, }
 and } Esqs. rusal of the Right Honorable the Gover-
 J. Lewis, }
 nor of Bengal, a report of Mr. J. O. Price's
 proceedings in respect to the experimental culture of cotton
 in the Dacca division, during the past month of September;
 and with reference to Government Orders of the 3rd of that
 month (No. 742) to take this opportunity of stating, that in

consequence of enquiries made through the General Post Office, it has appeared that the letter of the 7th of June last, to the address of the Commissioner of Dacca, referred to in the Board's letter to Government, (No. 335) dated the 27th August following, as having miscarried, had duly reached its destination, and that the Commissioner's application for a copy of it originated through a mistake of his own.

2. With reference to the concluding para. of Mr. Price's report, I am desired to intimate, that the Government Orders of the 11th ultimo, No. 755, authorizing the transfer of certain farming implements, &c. from Mr. Terry of Rungpore, were communicated to the Commissioner of the Moorsheda-bad division on the 13th idem, No. 122.

I have, &c.

(Signed) GEORGE PLOWDEN,

Offg. Secretary.

Fort William, 14th Oct. 1844.

From J. O. PRICE, ESQ. to J. DUNBAR, ESQ., Commissioner of the Dacca Division.

SIR,—I have the honor to submit to you, for the information of His Excellency the Governor General of India, the monthly report of my proceedings for the month of September.

In the early part of this month I was engaged for some days visiting several places to the westward of the river Dhullessury, once famous for growing largely the small Dacca kupas, and at which place a considerable quantity is still grown; but I went too soon to judge much of the lands, the inundation not having quite receded from the lands most used in cultivating the cotton plant, but it is my intention to again visit that district early in the ensuing month.

I next proceeded to examine some lands in Run Bhowal Zemindary, also called Berunja Division, and situated on

the river Banar; these lands had escaped my observation when I went up that river before being over-run much with jungle, but on examination I found them to consist of the richest black soil I have yet seen in this district, and where the natives have cleared any of it off, they all grow kupas with three or four crops mixed with it, and that with little or no cultivation after they put the seed into the ground.

On my return to Dacca, I went up the river Dhullessury for the purpose of examining the small patch of cotton I have at Foolbareea, and it affords me much pleasure in informing you that the American kind is bearing abundantly, and had it been planted in a proper season of the year, so as to have yielded its cotton in the dry months, it would have been very fine; but cotton picked in a wet season is always very inferior to what it otherwise would have been. The Bourbon seed I planted at the same place, and at the same time, I have cut down to the height of three feet as an experiment, it having run too much to wood, and for nine months, which is the length of time since it was planted, has never yet blossomed; it is now sending out fresh branches, so that I hope it may bear well in the dry season. This system I have never seen tried in the United States, but I am satisfied there is much information to be obtained respecting the cultivation of Foreign Cotton in this country, which can only be acquired by an experimental system of cultivation.

The Cotton seed from the Agricultural and Horticultural Society having arrived in proper time for the October planting, I hope the farming implements will also soon arrive.

I have, &c.

(Signed) J. O. PRICE.

Commissioner's Office, Dacca Division,

Dacca, the 2nd October 1844.

No. 378 of 1844.

*From J. DUNBAR, Esq., Commissioner of Dacca, to the
*Secretary to the Government of Bengal in the Revenue
Department, Fort William.*

SIR,—I have the honor to transmit a copy* of letter from
Mr. Price, cotton planter in this district,
Dated 10th Oct. 1844. applying for a supply of from eight to ten
maunds of cotton seed for the May and June sowings.

2. As the Agricultural Society do not appear to have any
available seed, I would suggest that the seed indented for
may be procured from Coimbatore. It is desirable, that
some portion of it should be of the kinds particularized by
Mr. Price.

I have, &c.

(Signed) J. DUNBAR,
Commissioner of Revenue.

*Commissioner's Office, Dacca Division,
Dacca, the 11th Oct. 1844.*

To J. DUNBAR, Esq., Commissioner of the Dacca Division.

SIR,—I beg leave, in reply to your letter No. 315, to state
to you, that I think if possible it would be well to obtain
from eight to ten maunds of cotton seed from Coimbatore
or elsewhere, in time for the May and June planting. I
should like much a part of it to be Tennessee and Sea
Island, so as to give these kinds a trial also in this district.

I have, &c.

(Signed) J. O. PRICE.

Dacca, 11th Oct. 1844.

No. 256.

*From the Under Secretary to the Government of Bengal,
to the Secretary to Government, Fort St. George.*

SIR,—I am directed by the Right Honorable the Governor
of Bengal, to annex copy of a letter from the Commissioner

of Dacca, dated the 11th instant, and of its enclosure, relative to cotton seed required for the Government experimental cotton culture in that district, with His Honor's request that the Most Noble the Governor in Council will be pleased to direct the issue of such orders as will ensure the early supply of the cotton seed from Coimbatore in the quantity and of the kinds specified.

I have, &c.

(Signed) C. BEADON,

Under Secy. to the Govt. of Bengal.

Fort William, 23rd Oct. 1844.

No. 397 of 1844.

From J. DUNBAR, ESQ., Commissioner of Dacca, to the Secretary to the Government of Bengal, Fort William.

SIR,—I do myself the honor to transmit herewith a copy of Mr. Price's report for the past month.

2nd. You will observe that no measures have been taken for the immediate establishment of the Experimental Cotton Farm. Finding that the quantity of seed at his disposal was far too small to admit of his laying down in cotton, any thing like the whole area which it is proposed to comprise within the farm, and having received none of the farming implements for which he had indented, Mr. Price consulted me on the expediency of postponing the experiment on a large scale till he should have at his command adequate means for carrying it out effectively, and giving it a full and fair trial. I agreed with him in thinking that, under existing circumstances, this was the wisest course which could be adopted, and that he could not do better, in the meantime, than to make arrangements for the cultivation of a number of beegahs proportioned to the seed in hand, on the lands of the Indigo planters, zemindars and others, who had promised their assistance and support. Mr. Price inti-

mates, that he will give a detail of these arrangements in his next report.

3rd. Upon the whole, I do not think, that this delay in the establishment of the Government Farm is to be regretted. During the past twelve months, Mr. Price has no doubt seen a good deal of the District, and satisfied himself to a certain extent, in regard to the qualities of the soil in various places; but his actual experiments in the growth of Cotton, were on so very limited a scale, that his opinions may yet undergo a considerable change. It seems to me questionable, (and this is admitted by Mr. Price,) whether the suitableness of the soil and climate of this District to the cultivation of Foreign Cottons, can be properly tested without having two Experimental Farms; one to the north, on the banks of the Banar, where the seed is sown in May and June, and one in the southern parts of the District, where the seed is committed to the ground, soon after the retirement of the annual inundation. Upon this point, Mr. Price will be able to speak with more certainty, sometime hence; and in the event of his deeming it advisable to have two plantations, I suppose there will be no objection to the measure.

4th. Mr. Price has been disappointed in not receiving a hand Saw Gin from Mr. Terry the Cotton planter at Rungpore. If they can be procured in Calcutta, I think it would be well that several Gins of this kind should be sent up.

5th. As no house could be procured at a moderate rent in Dacca, suited to Mr. Price's purpose, I authorized his hiring a house in Naraingunge. That place is much more accessible to boats of any burthen during the dry season, than Dacca; and in the event of the present experiments resulting in complete success, I think it is there we should have the machines for cleaning the Cotton and the godowns for storing it.

6th. Mr. Price is anxious to have an Apprentice, and I certainly think it is advisable that he should have assist-

ance of this kind. As the cultivation extends, it will be more and more difficult for Mr. Price if wholly unaided, to look after it properly. With the permission of Government, I will therefore look out for an intelligent young man, educated at one of the Government institutions. A salary of Rs. 20 or 30, per mensem, would be enough in the first instance.

7th. The box containing sundry parcels of Cotton referred to in Mr. Price's report, has been despatched by this day's dawk banghy. As far as I am able to judge, the samples appear to be such as to afford good hope of ultimate success. It would be satisfactory, however, to learn what is thought of them by the Agricultural Society.

8th. I take this opportunity of stating that, when the Experimental Farm is fairly entered upon, I think it very desirable that a body of able-bodied Dhangurs, or hill coolies, with their families, should be sent hither, for the purpose of cultivating it. I have consulted Mr. Price on the subject, and he agrees with me in thinking that a body of these men would be particularly useful for the purposes of the Farm. The men would till the ground, and rear the plant under Mr. Price's directions, and the women and children would be of the greatest use in cleaning and picking the Cotton, when arrived at maturity. If the Right Hon'ble the Governor approves of the suggestion, I would respectfully recommend that measures may be taken for having the required number of Dhangurs sent up towards the close of the cold weather.

I have the honor to be, &c.

(Signed) J. DUNBAR,
Commissioner of Revenue.

*Commissioner's Office, Dacca Division,
Dacca, the 4th November, 1844.*

To J. DUNBAR, ESQ., Commissioner for the 15th or Dacca Division.

SIR,—I have the honor to submit to you, for the information of His Excellency the Governor General of India, the monthly report of my proceedings for the month of October.

Having not yet received any part of the farming implements for the cultivation of the Government Experimental Cotton Farm in this District, and having consulted J. Dunbar, Esq. Commissioner of Dacca Division, on the propriety of confining my proceedings at present to that of the Ryuttee system of cultivation, and finding his opinion to coincide with my own, not only on account of want of farming implements, but also that of the limited quantity of Cotton seed forwarded by Government; I have therefore been, for the greater part of this month, engaged in making the necessary arrangements with the Zemindars for doing so, and in distributing the Foreign Cotton seed in my possession, in such a way as I trust may be the means of carrying out effectually, and successfully, the Ryuttee system of Cotton cultivation in this District. I intend therefore to defer the cultivation of Cotton on the Experimental Farm, until the month of May or June which is the season best suited for the cultivation of Cotton lands on the river Banar, in which locality I wish to establish the Farm, and in the intermediate time to make the necessary preparations for doing so. I cannot yet state exactly the number of beegahs of land I will have in Ryuttee cultivation, as the long holidays have prevented my getting the Cotton seed planted, but I hope in the course of ten days to have it all in cultivation. I will therefore, in my next report, be enabled to name the number of beegahs I have in cultivation.

3rd. On the 11th instant I received a few farming implements, and four bags of Cotton seed from Mr. Terry, Go-

vernment Cotton planter at Rungpore; two bags were of Bundlecund seed, and two bags of Mexican: the former, I regret to say, is not worth planting; but the latter two bags are fresh and good, and I am glad to say will afford me an opportunity of also giving that kind of Cotton a trial in this District. I regret much, that he did not send me one of the two hand Saw Gins that he informed me he had belonging to Government, as it would have afforded me an opportunity of introducing it among the Ryutts who have planted Government seed. If such a thing is to be had in Calcutta, I hope it will be added to that of the list of implements required for the Government Experimental Cotton Farm.

4th. I have, with the sanction of J. Dunbar, Esq. Commissioner, rented a house at Naraingunge for Government Cotton stores, &c. &c.; also to erect the large Saw Gin in, when it arrives. This place I consider the most central in this District, and consequently the best suited for the erection of machinery of that kind, besides it is a very large bazar, to which place a considerable quantity of Cotton is brought from the southern part of Lower Bengal.

5th. I have also had the honor to represent to J. Dunbar, Esq. Commissioner, the necessity of having a young man apprenticed to Government from a poor school or otherwise, whom I will instruct in the American system of Cotton cultivation, and who will, in case of my absence from indisposition, business or otherwise, from the Experimental Farm, be able to report to me, so as to enable me to report faithfully to Government.

6th. This report is accompanied with a box containing sundry parcels of Cotton grown at different places in this District from American Cotton seed, also a few bowls unpicked, so as to enable His Excellency to judge in some measure of the prospects of success in the cultivation of Exotic Cotton in this District. With respect to strength of staple, and colour of the Cotton, great allowance must be

made on account of its having been grown by persons unacquainted with Cotton cultivation, who in my absence allowed it to remain on the shrub until more or less injured by rain, and in some measure bleached. Had this not been the case, it would have been, in my opinion, superior to the Cotton sent to me from the Agricultural and Horticultural Society, which sample I also send in the box, and which was reported to be equal to New Orleans Cotton; and now that an advance is allowed by Government on the growth of Exotic Cotton in this District, and that the Ryutts are to be paid for it in proportion to the quality of the Kupas delivered to Government, I hope through my exertions to be able to convince the Ryutts not only of the necessity, but also the benefit they will derive by picking it at a proper time.

I have, &c.

(Signed) J. O. PRICE.

Dacca, Oct. 31st. 1844.

No. 969.

To the Secretary to the Sudder Board of Revenue.

SIR,—With reference to Mr. Commissioner Dunbar's Letter No. 397, dated the 4th instant, which should have been submitted through the Board, and of which a copy is now enclosed for their information, I am directed to state that the Governor of Bengal approves of the postponement of the Experimental Farm until next season, when Mr. Price will have had further opportunities of extending his enquiries into the quality and capabilities of the various soils and sites in the vicinity, and the necessary arrangements for commencing operations on a larger scale will have been completed.

2nd. The implements indented for by Mr. Price, regarding which you were addressed on the 16th ultimo, were despatched to Dacca on the 18th instant. The Government of

- the N. W. Provinces have likewise been requested to transfer to Bengal for Mr. Price's use all the farming implements purchased for the use of the American Cotton planters, but now no longer required in that quarter. And Mr. Terry, the period of whose engagement expires in April next, will be directed to make over the implements belonging to the Government, in his possession.

3rd. The box containing Cotton seeds has been received at this office, and forwarded to the Agricultural Society for examination and report; and the Governor General's Agent on the S. W. Frontier will be addressed on the subject of providing Dhangurs for the purposes mentioned by Mr. Dunbar.

4th. The Governor approves of the Commissioner having authorized Mr. Price to hire a house at Naraingunge for cleaning and storing the Cotton. In His Excellency's opinion, however, it was premature to secure a house before the implements were received, or any large quantity of Cotton gathered, and the rent of the house ought to have been stated.

5th. Application will be made to the Supreme Government to sanction the employment of an Apprentice on a salary of Rs. 20 a month.

I have, &c.

(Signed) C. BEADON,

Under Secy. to the Govt. of Bengal.

Fort William, the 20th Nov. 1844.

No. 282.

*To Lieut.-Col. J. R. OUSELEY, Governor General's Agent,
South Western Frontier.*

SIR,—The Commissioner of Dacca having applied for the services of several able-bodied Dhangurs, with their families

to be employed in the Experimental Cotton cultivation now in progress at Dacca, I am directed to request that you will place yourself in communication with that Officer, and take such measures as you may deem proper for sending to Dacca the number of people of that class that he may require.

I have, &c.

(Signed) C. BEADON,

Under Secy. to the Govt. of Bengal.

Fort William, the 20th Nov. 1844.

No. 428.

From the Under Secretary to the Government of Bengal, to the Honorary Secretary to the Horticultural Society.

SIR,—In continuation of my letter, No. 869, dated the 16th October 1844, I am directed to forward, for the Society's use, a copy of Mr. Price's reports from November to April last.

I am, &c.

CECIL BEADON,

Under Secy. to the Govt. of Bengal.

Fort William, 28th May, 1845.

SIR,—I have the honor to submit to you, for the information of His Excellency the Governor General of India, the monthly report of my proceedings for the month of November.

2. On the 2nd instant I left Dacca, and proceeded to Phoolbariah, for the purpose of planting Cotton seed; but finding the land not sufficiently prepared, I went from

thence to Manickgunge, at which place I remained until a part of the land at that place was sufficiently cultivated to receive the seed, and which I planted for the purpose of instructing the natives how to proceed with the remainder of the land that would not be ready for planting for a few days. On my return to Dacca I remained a few days at Phoolbariah, until I got a part of the land there sufficiently prepared for planting, which I planted, so as also to instruct the Ryuts there how to proceed with the remainder of the land, at that time not sufficiently cultivated. I had much pleasure a few days ago in hearing that the seed planted at that place had vegetated well, and was looking healthy; I have not yet heard any thing from Manickgunge respecting the seed planted there, but as they had the same seed, I hope on my visiting that place to find it also looking well.

3. On my leaving Phoolbariah I next proceeded to the district of Bickrampore, at which place I have got some land in cultivation, and which the Ryuts are now preparing for the seed. The land in that neighbourhood is very fine, but the paddy crop prevented my getting it cultivated sooner.

4. I next proceeded to Sonargong, at which place I will have from ten to fifteen beegahs of land in Cotton cultivation, and which the Ryuts are busily engaged in preparing. I therefore hope in a few days to have it all planted.

5. I have Cotton also planted on the Luckhia and two other places; but as I have not been able to visit either of them in this month, I cannot report on them, but will duly do so in my report for the month of December.

(Signed) J. O. PRICE.

Dacca, November 30th, 1844.

SIR,—I have the honor to submit to you, for the information of His Excellency the Governor General of India, the monthly report of my proceedings for the month of December.

2. Early in this month, I visited the locality of Sonargong, and found the Ryuts busily engaged in preparing the land I have in Ryutee cultivation at that place for the reception of cotton seed that they had been supplied with.

3. I next proceeded to the pergunnah of Bickrampore, at which place I found better than half of the land I have in cultivation there already planted, and the remainder ready for the seed.

4. On my leaving Bickrampore I next visited Naraingunge, at which place I have also tried a little of the Mexican seed received from Rungpore, which is partially vegetating.

5. On the 19th instant I proceeded to Dacca, for the purpose of taking charge of sundry packages of farming implements received from Government, for the use of the Experimental Cotton Farm or farms in this district, which are all well suited for the purposes they are intended for, excepting a carpenter's tool-chest, which is so small, and so few tools in it, as to be of no service in erecting either a cotton gin or cotton press; in fact, it does not contain any of the strong tools required for erecting machinery, such as large anchors, screws, vice, &c. &c.

6. I next visited Phoolbariah, at which place I have cotton seed planted on both sides of the Dhullessury, and on my arrival at that place I was truly sorry to find none of the New Orleans seed had vegetated, and very little of the Mexican kind had done so, although planted early in this month; and I also regret to state that the seed has not succeeded any better at Manickgunge; indeed I find it is worse than useless planting old cotton seed in this district, and I am afraid

that the full plant will be little better than a total failure. It may be remembered that Phoolbariah was one of the places at which exotic cotton seed was planted by me last year, and succeeded so well ; it has been yielding for five months, and is now loaded with bowls, that will open during the ensuing month, which is a convincing proof that the present failure is not occasioned either by soil or climate.

7. With respect to the correspondence I had the honor of having with you respecting the utility of having two Experimental Farms in this district instead of one, namely, one in the northern part of it where the land is high, and the seed planted in May and June, and the other to the southward where the land is low and the cultivation commences as soon as the annual inundation recedes sufficiently to admit of doing so, I have much confidence in agreeing with you that it will not only be the most satisfactory, but also the most advantageous way of becoming thoroughly acquainted with the different localities best suited for the cultivation of foreign cotton seed in this district ; besides it will afford the double advantage of having fresh cotton seed twice in the year instead of once. This will be of much service, I hope, as it appears to me, that after the American seed is kept for a short time in this district, it deteriorates very quickly. The native cotton seed retains vegetation much longer than that of the large American kind, which I think is occasioned by its smallness, and that of the husk being much stronger, which defends it against this climate ; still the natives here are aware of the difficulty of retaining the germinating quality in cotton seed for any length of time ; they consequently go to the trouble of putting it into earthen vessels and securing it from the air in various ways, and afterwards hang it up in their houses, over the place they make fire, which of course keeps it dry and prevents it from suffering from the humidity of the climate of this district.

8. It is to be regretted much the present failure in the first attempt at a Ryuttee system of foreign cotton cultivation in this district from old seed, as it will no doubt tend to damp the enterprize of those Ryuts who have in this instance tried it, as also those in the neighbourhood of which it has been tried; but now that the implements have arrived to establish the Government Experimental Cotton Farm, I feel confident, by being enabled by that means to supply the Ryuts with fresh acclimated seed, their confidence will soon be restored, without which it is impossible in my opinion to carry out the views of Government to a large extent.

(Signed) J. O. PRICE.

Dacca, 31st Dec. 1844.

SIR,—I have the honor to submit to you, for the information of His Excellency the Governor General of India, the monthly report of my proceedings for the month of January.

2. I regret much being obliged to inform you, that my visits during this month to the several places at which I have planted cotton seed has confirmed the opinion I expressed in clause No. 6 of my report for the month of December, namely, that from the inferior quality of the cotton seed planted, that the present attempt at establishing a Ryuttee system of cotton cultivation would be little better than a total failure; a small portion of the seed planted partially vegetated for a time, but from want of substance in the seed from which it sprung it soon disappeared again, not having sufficient strength to contend with the long continuation of dry weather we have had in this district.

3. I have much pleasure in informing you, that a little of the seed taken from the cotton grown at Phoolbariah has vegetated well, although only lately planted, and in the same

land as that on which the other seed planted failed ; this I trust will prove to Government that the present failure cannot be attributed either to the soil or climate of this district.

4. I have the honor of enclosing you with this report an account of the sundry sums of money paid away out of the three hundred (300) Rs. granted me by you for the use of the Government Ryuttee cotton cultivation.

(Signed) J. O. PRICE.

Dacca, 31st January, 1845.

SIR,—I have the honor to submit to you, for the information of His Excellency the Governor General of India, the monthly report of my proceedings for the month of February.

2. Early in this month I left Dacca and proceeded up the Luckia to meet you for the purpose of pointing out to you several places which I had the honor in my former reports to Government, to recommend as localities likely to suit the growth of foreign cotton, and on the 6th instant, I had the honor of meeting you at Bemrya, at which place we examined the land that I had reported favourably of to Government at that place; from thence on the following day after crossing the river Banar, we proceeded by land to Toke, also inspecting the lands in that district of the country, and on the succeeding morning (particularly,) examined the locality of Toke, of which I also had the honor of reporting to Government favourably of; on leaving that place I accompanied you further into the interior of that district, and on the following day accompanied you to examine the district of Capassia on the left side of the Banar, and from thence as far down the Luckia as Echdallah, at which place I remained a day and inspected that neighbourhood, after which

I returned to Dacca for the purpose of taking into consideration with you the advantages and disadvantages of the several places we had been to examine.

3. On my return to Dacca, finding that I had still spare time to enable me to examine Capassia on the right side of the river Banar, and particularly so as the coolies had not yet arrived, I again proceeded up the Luckia for that purpose, and after closely examining that part of Capassia, I am of opinion that the locality of Luttipore is particularly suited for May and June planting. I also beg leave to state, that I am of opinion 125 beegahs of land will be sufficient to commence the establishment of the experimental farm with, at that place, and particularly so as Government has approved of the establishing of two farms, namely, one in the Northern, and the other in the Southern part of this district; this will leave the same quantity of land out of the 250 beegahs named by Government for the establishment of the Southern farm, and should it be considered necessary hereafter to extend the farms, land can then be procured for that purpose.

4. The farming implements already received from Government will be sufficient I expect for both farms, and particularly so as the remainder of those at Rungpore are to be sent to this place, which will likely be here previous to our doing any thing on the Southern farm, as the planting season will not commence on it before October.

(Signed) J. O. PRICE.

Dacca, 28th February, 1845.

SIR,—I have the honor to submit to you, for the information of His Excellency the Governor General of India, the monthly report of my proceedings for the month of March.

2. Early in this month I proceeded to Phoolbariah for the purpose of making arrangements with a native at that place, who had offered to supply me with some cotton seed of the biennial kind, grown in Mymensing, and of which I reported to Government having seen at Dainroy, and also in Capassia, when bearing in the month of January 1844; but in so small a quantity, that I could not depend on it for seed. In this I regret I did not succeed, the native being absent from home; but I will take care to procure some of it in time for the planting season, however small the quantity may be for the first planting.

3. On my returning to Dacca I went on the Burrampooter also, for the purpose of securing some of the best native cotton seed in that district, but of the annual kind, which some of the natives have engaged to preserve for me when picking their crop in the month of May.

4. I next proceeded up the Luckia to Lukipore, with the intention of marking out the lines of the land at that place on which I intended establishing the farm, but finding that I could not get a sufficient quantity of land at any one place without a great portion of it being jungle, and taking into consideration that the coolies had not yet arrived, and the season so far advanced, I did not think it advisable to settle the farm at that place, and consequently give the preference to the land in the district of Toke, to which place you accompanied me in February for the purpose of inspecting.

5. On my return to Dacca, I found that R. E. Cunliffe, Esq., Collector, had sent a Mohurrer to me to lay down the lines of the farm and measure the land; but having not seen him on my way down the Luckia, I again proceeded to Toke, and pointed out to him the boundaries of the land I had selected, and on my return visited Bermya Bazar, and made arrangements for posts, &c. for the coolies' huts, on

my arriving at Dacca ; I also visited Meirpoor for the purpose of engaging choppers for the same.

(Signed) J. O. PRICE.

Dacca, 31st March, 1845.

SIR,—I have the honor to submit to you, for the information of His Excellency the Governor General of India, the monthly report of my proceedings for the month of April. *

2. On the 4th instant I proceeded to Meirpoor, and after giving advances for coolies' choppers, I returned to Dacca on the following day, and proceeded on my way to Toke for the purpose of visiting the several bazars in that district, so as to be able to purchase small posts, thatch, &c. &c. for the erection of the coolies' huts at as reasonable a rate as possible, but as those articles, and particularly that of grass, can only be got at this season of the year in comparatively small quantities at any one place, it will take a part of next month to complete what is required.

3. It is with much regret that I refer to the Dh~~u~~gurs applied for in January not having yet arrived, and the likelihood of its being some time before they do so, not that I ever intended planting to any extent in May, as in my opinion earlier than the 20th of June would be too soon for a general crop, as the bowls would open before the termination of the rains, and if not entirely destroy, the bowls would injure very much the colour and staple of the cotton, and I am of opinion at present that the month of July will likely prove the best month for planting, as cotton seed planted at that time should commence bearing early in November, and consequently would have the advantage of the dry season of the year for picking the cotton in ; however, it is my intention, if I can procure laborers, to plant less or more in every month up to October on^d the Toke farm ; but what I feel

most, the want of the Dhangurs for at present, is for draining and ridging the land, so as to prepare it for seed, without which a good crop of cotton can never be expected in so level a district as this is, and subject to such heavy rains as it is at this season of the year: [this precaution will of course not be required on the farm to the Southward of the district, as the seed will be planted in the early part of the dry season] but besides the above, their services are much required at present to make fences round the farm, and also to assist in erecting their own huts.

(Signed) J. O. PRICE.

Dacca, 30th April, 1845.

THE JOURNAL
OF THE
Agricultural & Horticultural Society.
OF
INDIA.

Report on the Cultivation and Manufacture of Tea in Kemaon and Gurhwal. By WILLIAM JAMESON, ESQ. Superintendent Botanical Gardens, North-Western Provinces.

From J. THORNTON, ESQ., Secretary to Government N. W. Provinces, to the Secretary to the Agricultural and Horticultural Society, Calcutta.*

General Dept. N. W. P.

SIR,—I am directed by the Honorable the Lieutenant Governor, N. W. Provinces, to place at the disposal of the Agricultural and Horticultural Society, for publication in their Journal, the accompanying copy of a Report from Dr. Jameson, Superintendent of the Government Garden, Saharunpore, on the Tea experiment now being carried on in Kemaon and Gurhwal.

I have, &c.

J. THORNTON,
Secy. to Govt. N. W. P.

Agra, 3rd September, 1845.

1. II. *Report on the Cultivation and Manufacture of Tea in Kemaon and Gurhwal.*

PART I. Kemaon.—The first part of this Report will be confined to a statement on the culture and manufacture of Tea in the province of Kemaon, and, in order to shew clearly what has been done, shall be treated as follows: 1st. Progress made in the extension of the Tea nurseries and the increase of the number of the Tea plants; 2dly. Quantity of Tea manufactured; 3dly. Expenditure, and probable income to be derived from the experiment as now conducted; 4thly. Estimate shewing the rate the Tea could be cultivated on an extensive scale, and the advantages attending such a speculation.

2. PART II. Gurhwal.—1st. Nurseries in Gurhwal, and numbers of plants in each; 2dly. On the manufacture of Tea in Deyra Dhoon; 3dly. Concluding remarks.

3. 1st. Progress made in the extension of the Tea nurseries, and the increase of the number of Tea plants.

4. Since last season the number of acres of land that have been planted with young Tea plants, amounts to, in

Russiah,	21	Acres.
Kooa Sar,	24½	
Anoo,	4½	
Kupeena,	1	
Hawalbaugh,	5	
Chullar,	20	
Total,		76

And the number of plants planted in each, amounts to, in

Russiah,	19,000
Kooa Sar,	31,512
Anoo,	7,923
Chullar,	30,866
Kupeena,	2,800
Lutchmaissaur,	2,000
	<hr/>
Total.	94,101

5. We have thus therefore planted all the ground, or nearly so, allotted to us by Mr. Senior Assistant Commissioner Batten, with the exception of a small space in the Russiah plantation, which will contain a few thousand additional plants. In September and November last upwards of four lacs of seeds, the produce of the nurseries, were sown, and of these 167,000 have already germinated, and they are still daily germinating, so that this season there will be sufficient numbers of young plants to cover 80 or 90 acres, and we can with our present establishment bring a large quantity of this land into cultivation. We shall therefore add 10 acres to Russiah, 3 to Bhurtpore, and 10 to Kooa Sar and Anoo. To the nurseries in the neighbourhood of Almorah we cannot add any additional ground, there being none procurable; we trust, however, to be able to establish a new nursery, a few miles to the westward of Hawalbaugh, of 26 acres, which will nearly bring our establishment to their full working condition, as I consider 3 acres of land as much as a single mallee is capable of doing justice to: moreover it will always be necessary to keep a large establishment in the nurseries of Lutchmaissur, Bhurtpore, and Kupeena, as from these, the necessary supplies of seeds (the original Chinese plants being there deposited) are principally obtained. The additions therefore contemplated this season, will amount to 47 acres. We append the following short account of each of the nurseries, in order that some idea may be formed of the nature of the land, and, at the same time, it will shew where extensions can be made.

6. *Nurseries—Russiah.*—Elevated 4200 feet above the level of the sea, consists of 49 acres, and is situated in a valley in the neighbourhood of the new Kouchiah lake, surrounded on all sides, the S. W. excepted, by mountains that rise to a height of several hundred feet. It admits of considerable extension. This nursery consists of a series of terraces which have a considerable inclination, and are

exposed to the S. W. The soil is light, of a silico-aluminous nature, and abounding in small pieces of clay slate, the subjacent rock. The supply of water is good, being procured from a small stream that forms its S. E. boundary.

7. *Bhurtpore*.—Elevated about 4400 feet, is situated on the acclivity of a small hill formed by the intrusion of a body of trap, amongst the Silurian rocks, which separates it from the Bheemtal lake. It consists of three acres, and is formed of terraces, which are highly inclined and very abrupt, and exposed to the North. The soil is of a similar nature to that of Russiah, and abounding with small masses of trap and clay slate. It extends to the small lake of Anoo Sar, which separates it from the Kooa Sar nursery. A portion of the intervening ground now lying waste, and consisting of about three acres, is being brought into cultivation. The supply of water is good.

8. *Kooa Sar*.—Elevated about 4200 feet, consists of $24\frac{1}{2}$ acres, and is situated in the valley of that name. It admits of considerable extension, and the supply of water from a small stream, which has its source on the northern or upper side of the valley, is considerable. The land has a considerable inclination, with a southern exposure. The soil is similar to that of Bhurtpore and Russiah.

9. *Anoo*.—This nursery consisting of $4\frac{1}{2}$ acres, is situated in the same valley as the last, and is only separated from it by the bed of a small stream that drains it during the rains. It too is capable of much further extension; but as the supply of water during the hot weather is precarious, it will not at present be extended. The soil, aspect, &c. are the same as Kooa Sar. Such are the nurseries that are first met with in the Chakata district on ascending the hills by the Bhamouree ghaut, and distant about ten miles from the plains.

10. *Kupeena*.—Elevated about 5200 feet, consists of about four acres of land, and is situated on the acclivity of the

Almorah valley; the terraces are highly inclined, with a southern aspect. The supply of water is good.

11. *Lutchmaissur*.—Adjoins Kupeena, and is about the same extent; has a similar exposure and elevation, and the terraces are equally abrupt. The soil of both is very light, being formed from the decomposition of the subjacent rocks, (clay slate and quartz rock,) intermixed with a small quantity of decomposed vegetable matter. The supply too of water is good. Neither admit of further extension.

12. *Hawalbaugh and Chullar*.—These two nurseries, situated in the valley of Hawalbaugh, and elevated about 3900 feet, adjoin each other; in the upper part the soil consists in some places of stiff reddish clay, the colour being caused by an admixture of peroxide of iron; the remainder, however, is in character very similar to the other nurseries described, consisting of terraces which extend to the bed of the Cosillah. The subjacent rock is clay slate, which is almost entirely composed of mica. All the rocks in the neighbourhood of Almorah and Hawalbaugh are metamorphic, caused by the intension of granite, which in many places is met with outcropping. This is well seen on the Almorah road leading to the plains before descending the Ghaut to cross the suspension bridge over the Cosillah.

Such is a short account of the different Tea nurseries in Kemaon. In their characters all appear to be very similar to each other, and all well supplied with water (with one exception,) which is essential to the welfare of the Tea plant. The range too of elevation is considerable, viz. from 3500 to 5200 feet above the level of the sea. Snow falls seldom in the Chakata district, but frequently to the depth of several inches at Almorah. The frosts too are frequently very severe at Hawalbaugh in December and January.

13. The following table shews the date of the formation of each nursery, the number of plants, and their ages.

Names of Nurseries	When established.	Number of Plants						1 Year now transplanting.	Seedlings which will be ready for transplanting in Sept next	Total.
		9 Years.	6 Years.	5 Years.	4 Years.	3 Years.	2 Years.			
Bhurtpore,	1835-6	268	"	647	205	355	1,368	868	2,000	5,301
Lutchmansur,	1835-6	260	1,000	1,300	"	"	4,760	16 040	1,020	24,980
Kupeena,	1841-2	"	"	"	1,000	5,600	3,480	30	570	11,980
Rusiah	1841 2*	"	"	"	15,320	1,267	9,268	10 925	20,310	57,090
Kooa Sar,	1844	"	"	"	"	"	28,712	2,800	1,35,000	1,66,512
Hawalbaugh,	1843	"	"	"	"	6,607	5,063	2,000	1,000	14,670
Chullar,	1844	"	"	"	"	"	11,366	2,500	7,000	20,866
Anoo,	1844	"	"	"	"	"	7,923	"	"	7,923
Total		528	1,000	1,947	17,315	13 829	71,940	34,663	1 66,900	3,08,122

* Rusiah was first established in 1841 2 and the position being an advantageous one, has annually been increased.

14. 2nd. *Quantity of Tea manufactured.*—The quantity of Tea manufactured has steadily increased, amounting last season to lbs. 375, being an increase of lbs. 185 on the former season. The following table will shew the progress made in making Tea, and the nurseries from whence leaves have been derived.

Names of Nurseries.	No. of acres.	Tea yielded in 1842.		Tea yielded in 1843.		Tea yielded in 1844.		Total.		Remarks.
		lbs.	oz.	lbs.	oz.	lbs.	oz.	lbs.	oz.	
KEMAON.										
Lutchmaissur, ..	3	16	..	95	7½	166	2	277	9½	
Kupeena,	4	5	..	37	4½	52	15	95	3½	
Bhurt pore,	3	4	12	39	15½	59	14	104	9½	
Russiah,	49	..	..	18	6	91	13	110	3	
Kooa Sar,	29	..	..	..	..	..	..	..	..
Anoo, .. ..	..	..	..	..	..	..	..	..	..
Hawalbaugh, ..	30	..	..	..	..	3	9	3	9	
Chullar, .. ..	..	..	..	..	..	..	..	..	..
Grand Total, ..	118	25	12	191	1½	374*	5	591	2½	

This table, though limited, is highly interesting and important; as showing that from a single nursery consisting of little more than 3 acres of land in which there were only 2,560 plants yielding leaves, the remainder upwards of 4,760 being too young, the produce received was equal to two maunds and two lbs. The first year's return of Tea is no criterion to judge of the progressive increase, as the Chinamen were only once or twice engaged in making Tea. But by the considerable increase of the 3rd year's produce over that of the 2nd, and from the table too it will be perceived, that in the 2nd year only some of the shrubs in two of the nurseries (Lutchmaissur and Kupeena) were giving their full return of leaves, some idea may be formed of the quantity that may ultimately be expected. This too is apparent from

* In addition to the 374 lbs. of Tea manufactured in 1844, there were lbs. 60 of very coarse Tea. This is probably too coarse for marketable purposes, and has therefore not been noticed.

the produce lbs. 91, 13, 0 of Russiah nursery, which was only established in 1841-2. The Tea plant does not yield leaves until the 3rd year; no doubt some, more forward than others, do, but I think that pulling leaves when the plants are so young is detrimental to their rapid growth. From the 3rd year it gradually increases its produce until the 8th or 10th, at which time it attains its maximum. From the number of plants now in cultivation the returns of Tea yielded will annually rapidly increase. From the data yielded by Lutchmaissur, we may consider that a minimum return per acre when all the plants come into full bearing, may be estimated at one pukka maund, which being sold at a rate of Rs. 3* per seer will yield Rs. 120. To each mallee on Rs. 4 per mensem, we ascribe the charge of three acres of land. A single acre therefore will cost Rs. 16 \times land rent Rs. 3=19 per annum, and thus a clear profit of Rs. 101 to cover the expense of Tea making, &c. will be left.

Names of Nurseries.	Present under cul- tivation,	Additions.	Total.
	Acres.	Acres.	Acres.
Russiah, .. .	49	10	59
Bhurtpore, .	3	3	6
Kooa Sar, .	29	10	39
Anoo, .. .			
Lutchmaissur,	3		3
Kupeena,	4		4
Hawalbaugh,	30	24	54
Chullar,			
Total,	118	47	165

The number of acres now in cultivation in Kemaon, as per table, may be estimated at 118; and which, I trust, will be

* At the sale of Kemaon Tea that took place at Almorah on the 12th ultimo, the average amount realized per seer was Rs. 4-8. The maximum price for Pouchong was Rs. 5-1, minimum Rs. 4-8. For Bohea the maximum Rs. 4-8, minimum Rs. 3-2. We have, however, estimated the price at Rs. 3, a sum which will always be obtained for the Almorah Tea. The above prices are high, and may have originated in the small quantity of Tea sold, viz. 173 seers.

raised this season to 165, which will yield, when all the plants come into full bearing as estimated, 165 maunds of Tea. This being sold at Rs. 3 per seer, will realize Rs. 21,600. The present expenditure in Kemaon is as follows :

TEA CULTIVATION.

Overseer,	Rs. 100 per mensem =	Rs. 1,200	
Mallees,	247 ..	=	2,964
Contingencies,	60 ..	=	720
			<hr/> 4,884 0 0

TEA MAKING AND PACKING.

10 Chinese Tea makers,	331 4 0 ..	=	3,975
2 Ditto Tea box-makers,	64 4 0 ..	=	771
4 Sawyers,	24 0 0 ..	=	288
			<hr/> 5,084 0 0

LAND RENT.

Present rent per annum,	Rs.* 247 5 8	
Rent of additional 50 acres, at Rs. 3 per acre,	150 0 0	
		<hr/> 397 5 8

Total Expenditure, Rs...	10,315 5 8
Omitted repairs, &c. per annum, ..	280 0 0

Total Rs...	10,595 5 8
Amount realized by the sale of Tea, ..	21,600 0 0

Balance, Rs... 11,004 10 4

15. This balance though good, is very far short of the amount that would be realized were the establishments better adjusted. Thus the present Tea manufacturing establishment with a small additional assistance in picking, &c. is capable of making at the rate of from 20 to 30 maunds daily, or of manufacturing Tea leaves procured from six thousand acres of land. The Nursery department (though on a sufficient scale to carry out the views of Government, viz. to prove that Tea can be advantageously cultivated, its good qualities having already been ascertained,) is therefore on a small scale compared to the former, and as long as this continues, the returns will always be very far short of what they ought to be.

* Some of the land now under cultivation is Government land, and therefore free of rent.

16. The following is a calculation shewing the rate at which six thousand acres of land can be cultivated, the expense of carriage, &c. and the return.

	Each	per Mon.	per Mon.	per Annum.	
CULTIVATION OF TEA.					
2 Overseers,	Rs. 100 0 0	200 0 0	2,400 0 0		
2 Assistant ditto,	60 0 0	120 0 0	1,440 0 0		
8 Moonshees,	10 0 0	80 0 0	960 0 0		
30 Chowdrees,	8 0 0	240 0 0	2,880 0 0		
30 Assistant ditto,	7 0 0	210 0 0	2,520 0 0		
1600 Mallees,	4 0 0	6,400 0 0	76,800 0 0		
					87,000 0 0
MAKING TEA.					
10 Chinese Tea manufacturers, ..	33 2 0	331 4 0	.. ..	3,975 0 0	
PACKING TEA.					
2 Chinese Tea box-makers, ..	33 0	66 4 0	795 0 0		
1 Chowdree Carpenter,	0 0 0	10 0 0	120 0 0		
1 Assistant ditto,	0 0 0	8 0 0	96 0 0		
12 Carpenters,	6 0 0	72 0 0	864 0 0		
8 Sawyers,	4 0 0	32 0 0	384 0 0		
					2,259 0 0
CARRIAGE.					
Carriage of 6,000 maunds of Tea to Bhamoree, at 1 R.					
per maund,				6,000 0 0	
Ditto 6,000 ditto of ditto to Ghurmuktissur Ghaut, at 25					
maunds, to each 4-bullock hackery, it being 8 stages,					
at Rs. 1-8 per stage=Rs. 12, and of these 240 will be					
required, $240 \times 12 =$				2,880 0 0	
Hire of eleven 600-maund Boats to transport the Tea to					
Calcutta, Rs. 220 each, $Rs. 220 \times 11,$				2,420 0 0	
EXTRAORDINARY CONTINGENT EXPENSES.					
Wood for boxes, repairs, additional coolies, &c. 600 0 0				7,200 0 0	
LAND RENT.					
Land rent of 6,000 acres, at Rs. 3 per annum,				18,000 0 0	
					36,500 0 0
Total Expenditure, Rs... ..				1,29,734 0 0	
To value of 6,000 maunds of Tea, or 2,40,000 seers, at					
Rs. 2 per seer,				4,80,000 0 0	
					3,50,266 0 0
Balance, Rs... ..					
Or say that the Tea is sold at Rs. 1-8 per seer, 2,40,000					
$\times 1-8,$				3,60,000 0 0	
Expenditure, Rs... ..				1,29,734 0 0	
					2,30,266 0 0
Balance, Rs... ..					

17. This estimate is as accurately calculated as our data will admit. But the establishment and contingencies are estimated on the most liberal scale, and therefore I do not consider the return over-rated. The first object of attention in this estimate is, the number of men required to work in the plantations, and the question arises, is such a large body of men procurable? From the information that I have procured in passing through Kemaon and Gurhwal, I believe that four or five thousand men, if necessary, could be obtained. Such too is the opinion of Messrs. Batten, Ramsay, and Huddleston, all intimately acquainted with the resources of the provinces over which they preside. Moreover, though I have put it down in the estimate, I do not consider that it will be necessary for the parties who manufacture Tea to keep up nurseries on their own account. On the other hand, I am confident, that natives by encouragement, and by making advances, will be induced to undertake the cultivation of the plant; a certain sum per seer for kutcha leaves being paid to them at the manufactory, and from the vast return they can be paid in a liberal manner. Kutcha leaves yield one-fourth their quantity of pukka Tea. A zemindar pays his jumma to Government at the rate of 12 annas per bissha.* The following table, for which I am indebted to the kindness of Capt. Ramsay and Capt. Huddleston, will shew what profits are realized by the cultivation of different kinds of grains, and the advantages that must result by cultivating Tea. Moreover the very circumstance that the cultivation of Tea, in addition to vast pecuniary advantages, is attended with but comparatively light labour, would be another inducement to make the natives undertake the cultivation of the plant. If, therefore, this system could be generally established, a sum of upwards of 1,01,000 rupees, placed in the estimate for mallees and land rent, would be

* A bissha is about 20 yards short of an English acre.

at the party's disposal to carry out the above measure. The advantages, too, of throwing into this poor country such a sum of money would be great for the agricultural population.

18. In the table comprehending the purgunnahs of Almorah, Kalli Kemaon, Shore Kemaon, and the province of Gurhwal the only grains it will be perceived that give a good return are wheat, barley, and rice; but the low rate that they bring varying from 5 annas to 1 rupee per maund, and in districts distant from Almorah, and the other large towns, there is no market; so that the zemindars in order to get rid of their produce, sometimes have to carry it fifty, one hundred or more miles, and for this receive less than they would have had they been employed merely as a coolie in carrying a load.* On the other hand, for a maund of kutcha Tea-leaves, they would receive at the manufactory five or six times the amount procured elsewhere for any other produce, which would remunerate them well for their labour even though the leaves had to be brought from a considerable distance. The picking too of leaves could be performed by the women and children of the different villages and thus add to their profits.

* The average rate of coolie hire varies from 2 to 4 annas per stage of 10 to 12 miles.

Table shewing the rate of produce yielded by different kinds of Grains in the pargunnahs of Kemaon and Gurhwal.

ALMORAH.

Rubbee Crops sown in the Cold Season.

Names of Crops	When sown.	When reaped.	Seeds of Bussa.	Maunds of produce per Bussa of su- perior land.	Maunds of produce per Bussa of in- ferior land.	Maunds of produce per Bussa of mid- dling land.	Bazar rate per maund.	Remarks.
Wheat,	Oct. & Nov.	April.	* 20 nallees.	15 maunds.	5 maunds.	10 maunds.	1 Rupee.	* A nallee is equal to about two seers of 83 Furruckabad sicca weight: it varies in weight in some dis- tricts.
(Triticum vulgare.)								
Barley,	Sept. & Oct	March	30 "	30 "	10 "	20 "	8 As.	
(Hordeum hexastichon.)								
Musoor,	August	April.	5 "	8 "	3 "	5 "	1 Rupee	
(Ervum hirsutum.)								

Khurrif Crops sown in the Rainy Season.

	Sept.	30 nallees.	40 maunds.	14 maunds	17 maunds.	12 As.
Dhan,	Sept.	8 "	20 "	7 "	14 "	12 "
(Oriza sativa.)						
Mandoo,	Oct.	10 "	20 "	7 "	14 "	8 "
(Eleusine coracana.)						
Jhangura,	Sept.	24 "	15 "	5 "	10 "	9 "
(Panicum frumentecum.)						
Bhut,	Oct.	20 "	8 "	3 "	5 "	R. 1-1
(Phaseolus.)						
Oorud,	Do.	4 "	6 "	2 "	4 "	" 1-8
(Phaseolus radiatus.)						
Teel,	Sept.	5 "	10 "	3 "	6 "	10 As.
(Sesamum prostratum.)						
Cheena,	Aug.					
(Panicum miliaceum.)						

Table shewing the rate of produce yielded by different kinds of Grains in the pargannas of Kemaon and Garhwal.

SHORE KEMAON.

Rubbie Crops sown in the Cold Season

Names of Crops	When sown	When reaped	Seeds of seeds per Bissa	Maunds of produce per Bissa of prior land	Maunds of produce per Bissa of infertile land	Bazar rate per maund	Remarks.
Wheat (Triticum vulgare)	Oct & Nov	May.	14 seers	1½ maunds	30 seers.	1 maund.	1 Rupee
Barley ..	Ditto	Ditto.	20 ,	8 ,	1 maund.	1½ ,	1 Anna
(Hordeum hexastichon)	Sept & Oct	April	10 ,	1 ,	20 seers.	30 seers	12 As
Musoor ..	Aug & Sept	Ditto	2½ ,	20 seers	10 ,	15 ,	R 1-1
(Eryum hirtutum)							
Isel, ..							
(Sesamum prostratum)							

Khurrif Crops sown in the Rainy Season

Names of Crops	When sown	When reaped	Seeds of seeds per Bissa	Maunds of produce per Bissa of prior land	Maunds of produce per Bissa of infertile land	Bazar rate per maund	Remarks.
Dhan on hills (Oriza sativa.)	April.	Sept & Oct	20 seers	8 maunds.	1 maund.	1½ maunds	5 As
Ditto in valleys, (Ditto.)	May	Oct & Nov	10 ,	9 ,	1 ,	1½ ,	5 ,
Ditto Basmati in ditto, (Ditto.)	April	Ditto.	10 ,	8 ,	..	....	8 ,
Ditto ditto on hills, (Ditto)	Ditto	Ditto	20 ,	2 ,	30 seers.	1 maund	8 ,
Mandooa, (Eleusine coracana)	May	Ditto.	4 ,	2½ ,	30 ,	1 md 1 cr.	1 Anna

in

SH

KJ

opi

R.

Names of Crops.	When sown.	When reap- ed.	Seeds of seeds per Bissa.	Maunds of produce per Bissa of su- prior land.	Maunds of produce per Bissa of infe- rior land.	Maunds of Ba- produce per rate Bissa of mid- mau- ding land.
Oorud, (Phaseolus radiatus.)	June.	Oct. & Nov.	8 seeds.	1 maund.	20 seers.	1 Rup.
Bhut, (Phaseolus)	Ditto.	Ditto.	10 "	1 md. 1 seer.	32 "	11 As
Teel, (Sesamum prostratum.)	Ditto.	Sept. & Oct.	1 "	20 seers.	8 "	R. 1-]

K E I A O N.

Crops
ig th Cold SeaW
(T
&

LOCALITY
from 14
20 seers
11 cool d
from 20
30 seers

var
title
3
11
11
3

im
ast
im.

Table showing the yield of different kinds of Grains in the paddy fields of Kallikottai.

KALLIKOTTAI.—(Continued.)

Grains sown in the Rainy Season.

Names of Crops	When sown.	When reaped.	Maunds of produce per Bissa of superior land.	Maunds of produce per Bissa of inferior land.	Maunds of produce per Bissa of middling land.	Basar rate per maund.	Remarks.
Dhan, .. (Oriza sativa)	7 & 10	Oct. & Nov.	17 to 18 mds.	4 to 5 mds.	10 to 12 mds.	10 As.	
Ditto Basmati (Ditto.)	May.	November.	Ditto.	Ditto.	Ditto.	R. 1-1	
Mundoo, .. (Eleusine indica)	June.	{ Ditto and another kind in September.	14 to 15 mds.	7 to 8 mds.	10 to 12 mds.	10 As.	
Ordinary .. (Phaseolus radiatus)	July.	November.	6 maunds.	3 maunds.	5 maunds.	R. 1-10	
Bhat, .. (Phaseolus ..)	Ditto.	Ditto.	7 "	1½ "	4 to 5 mds.	R. 1-8	
Teel, .. (Sesum orientale)	June	Oct.	4 "	1 "	2 to 3 "	R. 1-12	

C

Crops.	When sown.	When reaped.	Seeds per Bissa	Maunds of produce in a good year.	Maunds of produce in a bad year.	Average Crop.	Nirick	Remarks.
Wheat. (Triticum.)	Oct. & Nov.	April & May.	15 to 20	5 maunds.	2 maunds.	3 maunds.	4 Aa.	Situation, aspect, and nature of soil in a hill country so much determine the quantity of seed to be sown and amount of produce, that but very distant approximation to the truth can be given; not only different purgunnabs and puttas widely differ, but even almost every village in each putta would be found to vary equally.
Barley, (Hordeum)	Ditto.	Ditto.	20 to 25	6 "	2 "	5½ "	3 "	
Teel, .. (Sesamum)	September.	Mar. & April.	2 to 3	1 "	4 "	3 "	R. 1-4	
Musoor, (Ervum hirsutum)	Oct. & Nov.	April.	12	2 "	4 "	1½ "	1 R.	
Peas, .. (Pisum.)	Ditto.	Ditto.	16	4 "	1 "	3 "	1 "	

Kh. if Crops.

Dhan . .. (Oriza sativa.)	Oct. & May.	Sept. & Oct.	20 to 40	8 to 12 m	Every thing depends on situation, aspect, and nature of soil as to quantity of seed, amount of produce, so that but a very faint approximation to the exact state of the case can be given.
Mandooa, .. (Eleusine corac)	May.	Oct. & Nov.	4 to 7	8 maunds	
Jhangoor, .. (Panicum frumentaceum)	March.	Sept. & Oct.	2 to 3	1 to 8 m	
Oorud, .. (Phaseolus radiatus)	July.	November.	8 to 10	3	
Bhut, .. (Phaseolus.)	Ditto.	Ditto.	Dit	1	

Gd 1A

Kharif Crops. — (1894.)

Crops.	W/	W/	Seeds sown By	Maunds of produce in a good year bad year.	Average Crop	N. k.	Remarks
Teel,	May & June	September	2	1 1/2			
(Sesamum prostratum)							
Bhang,	June.	November	6	3			
(Cannabis sativa.)							
Cheena,	May.	August.	3 to	2		4 A	
(Panicum miliaceum)							
Phaphur,		Sept. & Oct.	2 to				
(Polygonum.)							
Cotton,		Oct. & Nov.					
(Gossypium arboreum)							

19. With reference to carriage, I have placed this item in the estimate more for the purpose of shewing that advantages would attend the transportation of the Tea even to the mercantile capital of India. Not that I deem it necessary. On the other hand, the letters of Messrs. Batten and Huddlestons* shew, that in our hill provinces a considerable outlet for the produce of the manufactories would be obtained. To Capt. Ramsay, I am indebted for the following valuable observations made by him last season, when on a tour of duty to the British frontier, on the Tea trade of Bhote :—"From enquiries the Tea trade in Bhote appears to be carried on in two ways : 1st, bricks of Tea, in weight about three seers each, and varying from that to $3\frac{1}{2}$ seers, are imported into Bhote to the value of a lac of Rupees by the Lhasa Government. This is called *Jemy Chemy Pan*, or the Sirkaree trade. It is brought on jooboos in July, August and September, about 30,000 to 40,000 Rs. worth is divided amongst the Bhote Tokdars. Each is required to pay 10 Rs. per cake, and he adopts the same system towards his underlings, or Assamees, for getting rid of whatever may be debited to him. One Gomashta has charge of all to Manaserawar, where the respective divisions are made and despatched to Guntokh, Tukla-kal Dassoo, &c. and a Gomashta sent with each batch. The remaining 60,000 or 70,000 Rs.

* The following extract shews Captain Huddleston's opinion as given in Para. 2nd of his letter to Mr. Lushington, dated 21st April, 1844: "Tea would become, no doubt, of general use to the middling and better classes, whilst it would be used by the poorer as a medicine if it were cheaper, and thus greater quantities would be imported; but the price, 3 or 4 Rs. per seer, puts it quite out of the power of the people to indulge in so expensive a luxury; but perhaps in the course of some years hence, as the Government Tea nurseries increase, the zemindars may be induced to take up the cultivation of the Tea plant on their own account, thus proving a source of profit to themselves, as well as an easy means of supplying leaves to the Government manufactories; for many spots of the large tracts of, now, uncultivated waste in this province might be found, no doubt, well adapted to the growth and propagation of the Tea plant."

worth is sent to Ladakh, where the Lhasa Government set up a regular shop. The finest Tea is sent to Ladakh. The Chinese name of the cake is 'Doom,' and the mode of selling it by arbitrary settlement on the Tokdars is called 'Poogar.' The other trade is Khoosh-khurreed, and in value amounts to one lac of Rupees, but the quantity thus imported is double that of the Government trade. Each cake brought in this way sells for about 5 Rupees. The Lhasa people part with it to our Bhotias for cloth, sugar, &c. to the value of 40,000 or 50,000 Rupees, and they retail it at Gurtokh, &c. to the Hoondesees for cash. The remainder is disposed of to the Hoondes' people. Very little Green Tea is brought into Bhote, and what is brought is considered double the value of the Black, and all sent to Ladakh. Our Bhotias find little sale for the Lhasa Tea on our side, and do not import more than 100 cakes; a little of this they sell at Bagessur. The rest they consume themselves. For the Tea received the Bhotias give in value goods to the amount of Rs. 4 on a cake, and re-sell it for 5 to 6 Rs. The Bhotias assemble annually at Moonshera to transact business in May." That the Kemaon Tea would be appreciated too there, and supersede that at present consumed by the inhabitants I doubt not, judging from the samples of Tea now used, that I have seen. Mr. Bayley, C. S., took some of the Kemaon Tea to Kunnowur, and has favoured me with the following observations: "The Tea that I took to Kunnowur from Almorah was a common Black Tea, and had been partially damaged. I shewed it to several people, principally at Hango and Chango on the S.W. branch of the Sutlege, and asked them what they thought of it. They said, on tasting, that 'it was much better than their own,' and eagerly asked for presents of it. I then asked what price such Tea might fetch at the market they frequented in the Chinese dominions; and they answered,

that they could not tell as they had never seen such for sale, but that for the coarse Tea they paid usually one rupee per seer." These men traded principally with Chunovotee and Ladakh. Moreover, as remarked in a former communication, in Upper India a large market could be created was the price of Kemaon Tea moderate, the high rate of China Teas alone preventing the middling and poorer classes from purchasing them. The Commissariat too might be supplied from this source, and thus a good Tea would always be available for European Corps.

20. With reference to land, such a tract of country as 6000 acres, could not easily be obtained in any one district in the hills, having all the requisites necessary for good Tea cultivation. From what we have stated in former reports it is shewn, that the Tea plant not only thrives well in Kemaon, but also in Gurhwal, as at Guddowlee, Koath, and Ramaserai in the mountainous tract of this province; Kaolagir in the Deyra Dhoon. We have thus the plant thriving over about 4° of latitude and about 3° of longitude. A manufactory could be established in addition to that at Hawalbaugh in the Chakata district, a 3rd at Paoree, and a 4th at Deyra,* provided that the Tea now manufacturing is proved to be of good quality, and a marketable article. But it is a great mistake to suppose, that the quantity of land available and adapted to Tea cultivation in the hills is small. The

* If the Deyra Dhoon Tea proves to be of good quality, a tract of 100,000 acres could easily be obtained for the cultivation of the Tea plant. In the Attica Grant in the Western Dhoon, there are 5500 acres of land now unappropriated, and well adapted for cultivation. In the Western Hopeton Grant there are 5500 acres, and in the Centre Hopeton Grant 3500. All this land is generally cleared, so as to admit an immediate cultivation. The Kutter Putter Canal, proposed to Government by the present able and talented Superintendent, Mr. Vansittart, to be made at an expense of Rs. 90,000, will bring into cultivation about 17,000 acres of unappropriated land, all or the greater part of which, is suited to the Tea plant. The Eastern Dhoon too, the greater part of it at present an uncleared jungle, presents an inexhaustible field for extending the growth of the plant as soon as all the land in the Western Dhoon has been appropriated.

province of Kemaon alone is calculated to contain 10,965* square miles, which is thus divided :

Snow,	$\frac{4}{15}$	2924 square miles.
Barren and incapable of cultivation,	$\frac{5}{15}$	3655 " "
Cultivated,	$\frac{3}{15}$	2193 " "
Uncultivated,	$\frac{8}{15}$	2193 " "

And that of Gurhwal of 9000 square miles. The province too of Sirmoor contains much land well adapted for Tea cultivation. This also applies to a large portion of the hilly country East of the Sutlege.

21. PART II. *Gurhwal*.—1st. *Nurseries*.—The nurseries in Gurhwal are four in number : namely, the Guddowlee nursery in the neighbourhood of Paoree, elevated about 5300 feet above the level of the sea. Koath in the Bhuddree valley, elevated about 5000. Ramsarai in the valley of that name, about the same height. In all these localities snow falls, and in the last mentioned nursery frequently to the depth of two to three feet, and lies for weeks : it is distant six long marches from Mussoorie. Kaolagir, situated in the magnificent valley of the Deyra Dhoon, elevated about 2200 feet.

22. The following statement will shew the number of plants in each :

Names of Nurseries.	Number of Acres.	Number of Plants.
Guddowlee,	3	5,000
Koath,	1	729
Ramsarai,	1	728
Kaolagir,	6	8,000
Total,	11	14,457

* See Trail, Trans. A. S. vol. xvi. page 138.

287 of the plants in Koath and 180 in Ramsarai, were imported from China, or rather raised from seed in Calcutta, sent from China by Dr. Gordon, and transmitted by orders of Government, some to Assam, and others to Gurhwal and Kemaon; and from these original plants all the others now growing in the different nurseries in Gurhwal and Kemaon, have originated.*

23. The additional land added to Kaolagir, has been planted.

24. 2nd. *Manufacture of Tea in Deyra Dhoon.*—In compliance with the orders of Government, there are now three Chinese engaged in manufacturing Tea at Deyra. A report on the quantity manufactured, with samples, will be transmitted to Government at the end of the season, in order that its quality may be tested in England, and by the Board of Commerce of Calcutta.

Sale of Tea.—A sale of Tea took place at Almorah on the 12th ultimo, and the amount realized per seer was highly satisfactory, averaging from Rs. 3-2 to Rs. 5-1 per seer. A second sale will take place at Almorah, in January next. The quantity sold was small, amounting to 173 seers. In addition to this, there are 8 boxes reserved for the Court of Directors, which will be sent to the Secretary to Government of Bengal for transmission to England in the ensuing cold weather. The invoice, as soon as the boxes are ready to despatch, or rather as soon as the weather will admit of it, will be sent to Agra.

3rd. *Concluding remarks.*—To recapitulate on the foregoing observations. We have given a short account of each nursery, stated the position and number of Tea plants; the quantity of Tea now yielded, and the amount that may ulti-

* In addition to the Tea plants mentioned as occurring in the different Government nurseries, numbers are also to be found in the gardens, &c. of Europeans and Natives, raised from seeds distributed by the Superintendent at my request.

mately be expected. We have also mentioned the number of acres that were brought into cultivation last season, and the number about to be added in the ensuing cold weather. We have shewn the extent to which the experiment ought to be carried by Government, in order to give a good remunerative return for the invested capital. We have pointed out by estimate the advantages that would result by cultivating the Tea plant on an extensive scale. We have speculated as to an available market, and finally we have shewn that there is abundance of land in the hills adapted to Tea cultivation. 2ndly. We have noticed shortly the nurseries in Gurhwal, and the number of plants in each, and the manufacture of Tea at Deyra. We have not however, we regret, been able to furnish the Manual called for by the Honorable the Lieutenant-Governor, giving an account of the Tea plant; its management, the soil best adapted for its growth, &c.; method of manufacturing different kinds of Tea, &c.; and this too owing to the green Tea implements indented for upwards of three years ago not having arrived at Hawalbaugh prior to our departure in June last, it being necessary for us to proceed to Deyra in order to establish the Tea manufacturers there. We shall again however return to Kemaon in September, and shall furnish the report called for (the implements having now reached,) as soon as we have seen, and thoroughly comprehended, the different processes of manufacturing Green Tea.

26. With reference to teaching natives the mode of making Tea, the orders of the Honorable the Lieutenant-Governor have, I trust, been fully carried out. The Chinese manufacturers are always ready and willing to explain the different processes of making Tea to individuals desirous of becoming acquainted with them, and in addition there are natives belonging to the establishment expressly appointed for this purpose. A large and airy manufactory has been erected in Kemaon, to which every respectable person has

access during the time of making Tea. At Deyra the Tea is manufactured in the verandah of a large house in the new Bazar, and the facilities there presented for learning the process of making black Tea* are equally great.

(Signed) W^m. JAMESON,

Office of the Supdt. Bot. Gardens, Supdt. Bot. Gardens.
N. W. P.

Saharunpore, 31st July, 1845.

Botanical Observations in Upper Assam; being Part 6th of a Report on the Operations of the Assam Company in the Southern Division, to the month of February, 1843. By J. W. MASTERS, ESQ.

JAMES HUME, Esq., *Honorary Secretary A. and H. Society of India.*

MY DEAR SIR,—I have the pleasure to forward for the Society's Journal, "Part 6th of a Report on the operations of the Assam Company in the Southern Division, to the month of February 1843." It consists entirely of Botanical observations, and is in fact little more than a list of dried plants forwarded to Sir W. J. Hooker, in June 1843. Since that time I have devoted myself entirely to an investigation of the Flora of Assam; as I did not reserve a single specimen of my former collections, I cannot now take advantage of these observations, but am obliged to examine every specimen as I gather it. I therefore send the paper to you in the state in which it was drawn-up for the Assam Company two years ago.

* To make Green Tea at Deyra would have incurred a considerable expense without any adequate return, owing to the small quantity of leaves now procurable; a large building, &c. being required for the purpose. It was not therefore deemed necessary to recommend such an outlay, as, if the leaves yield good Black Tea, they will, according to the Chinese manufacturers, afford good Green.

Parts 1 to 4 were published by the Local Board, and Part 5 in the "Calcutta Journal of Natural History," vol. 4.

I remain, &c.

Seeksagur, 8th June, 1845.

J. W. MASTERS.

These observations are confined entirely to that part of the valley of Upper Assam, lying between N. latitude $26^{\circ} 35'$ and $27^{\circ} 35'$; and E. longitude $94^{\circ} 30'$, and $95^{\circ} 30'$, bounded on the East and South by the Naga Hills; on the West and North by the Brahmapootra river. Nearly all of the plants here enumerated have been collected between the Dessi and Booree Dihing rivers, at elevations not exceeding 650 feet above the level of the sea.

The mean annual temperature of this part of the valley is, (as shown by a Register kept at Nazera, a central situation,) 73° ; mean temperature of the four hottest months 82° , and of the four coldest months 63° . There is rain in every month in the year, but the greater part falls between February and October, varying from about 80 to 100 inches annually. In the following synopsis are arranged a few of the plants which I have met with, and all that I have been enabled to arrange; the whole number I presume does not contain a fourth part of the Flora of this very small portion of the valley.

Exogenæ.

Ranunculacæ.

Ranunculus, Linn.

1 — sceleratus, Linn.

2 spicus.

Naravelia, D. C.

3 Zeylanica, D. C.

Clemates, Linn.

4 Goureana Roxb. ?

5 Smilacifolia, Wall.

The plants of this family scarce in this part of Assam. *N. zeylanica* is very common, and Major Jenkins informs me that *C. smilacifolia* is plentiful in Lower Assam; both of these are ornamental, climbing plants.

Papaveraceæ.

Papaver, Linn.

Fennaria, Linn.

6 Somniferum, Linn.

7 Parviflora, Linn.

The common white Poppy is very generally cultivated by the natives for the opium, or *Kani* which it yields; but I have not met with any species wild, nor have I seen any of those dreadful effects which are said to follow the smoking, or drinking of opium, although I have been three years in the country; I could not have been three hours in any seaport, or manufacturing town in Great Britain, without witnessing the ill effects of drinking spirituous liquors.

Nymphaeaceæ.

Nymphæa, Linn.

Nelumbium, Juss.

Nos. 8, 9 and 10, 3 species.

11 and 12, the red and white varieties.

This family grows to great perfection in all the large tanks, especially the white Nelumbium, which produces flowers much more fragrant than any I have met with in Bengal.

Magnoliaceæ.

Michelia, Linn.

16 Species.

13 Champaca, Linn.

Magnolia, Linn.

14 Oblonga, Wall. ?

17 Sphainocarpa ?

15 Species.

18 Pumila, Andr.

These beautiful ornamental plants, producing exquisitely fragrant flowers, are common in the plains, and towards the foot of the hills, generally called *Sopa* by the natives. *M. pumila* has lately been introduced from the Botanic Garden.

Anonaceæ.

Uvaria, Linn.

21 Species.

19 Bicolor, Roxb.

Anona, Linn.

20 Undulata, Roxb.

22 Squamosa, Linn.

The Custard Apple has been several times brought to me from the villages, but I have seldom met with the tree

except in gardens, where it has lately been introduced from Gowhatti or Bengal; I presume it is not a native of Upper Assam. The *Uvareæ* are common.

Dilleniaceæ.

Dillenia, Linn.

23 *Speciosa*, Thunb.

Delima, Linn.

24 *Sarmentosa*, D. C.

The first of these is exceedingly common; and the fruit, called *Otega*, is eaten by the natives as eagerly, and apparently with as much zest, as mangoes are eaten in Bengal, or apples in England. The juice of this fruit is mixed with the *Mishmee Bih* to prepare the poison for arrows.

Umbelliferæ.

Ligusticum, Linn.

• 25 *Diffusum*, Roxb.

• *Anethum*, Tourn.

26 *Sowa*, Roxb.

This part of Assam is meagre in *Umbelliferæ*; but the European esculents, Carrots, Parsley and Celery, succeed well here, and their cultivation might be increased to any extent, so far as to supply Calcutta with seed, if required.

Araliaceæ.

Aralia, Linn.

27 *Digitata*, Roxb.

Panax, Linn.

28 *Aculeata*, Ait.

29 *Fragans*, Roxb.

30 *Species*.

Several other species of this family are to be found near the hills, and in Muttuck.

Vitaceæ.

Vitis, Linn.

20 *Species*,

No. 31 to 50.

Leea, Linn.

9 *Species*,

No. 51 to 59.

A great variety of vine-like plants to be met with every where, the fruit scarcely edible; the ripe berries of some are eaten eagerly by the natives under the name of *Puniali*. Intense acidity, is sufficient to recommend any fruit to an

Assamese. The common grape vine might, without doubt, be cultivated on elevated spots in Upper Assam.

Olacineæ.

- | | |
|----------------------------|--------------------|
| Olax, Linn. | 61 Scandens, Roxb. |
| 60 Imbricata, Roxb. | |
| Ornamental plants, common. | |

Onagraceæ.

- | | |
|---------------------|-----------------|
| Onochea, Linn. | Ludwigia, Linn. |
| 62 Species. | 64 Species. |
| 63 Ditto. | 65 Ditto. |
| Trapa, Linn. | |
| 66 Bispinosa, Roxb. | |

The first four are small plants with yellow flowers, the last produces the *Singhara* nuts, and is common in tanks.

Combretaceæ.

- | | |
|------------------------|-------------------------|
| Terminalia, Linn. | Combretum, Linn. |
| 67 Chebula, Retz. | 72 Acuminata, Roxb. |
| 68 Citrina, Roxb. | 73 Chinensis, Roxb. |
| 69 Angustifolia, Jacq? | 74 Rotundifolium, Roxb. |
| 70 Catappa, Linn. | 75 Pilosum, Roxb. |
| 71 Species. | 76 Species. |
| | 77 ——— |
| | 78 ——— |

The first genus is composed of valuable timber trees, the other of ornamental climbing plants. T. Catappa, *Dessee Budam* of Bengal, has lately been introduced from the Botanic Garden.

Loranthaceæ.

- | | |
|--------------------|------------------------|
| Loranthus, Linn. | 81 Ferruginosus, Roxb. |
| 79 Bicolor, Roxb. | 82 Species. |
| 80 Globosus, Roxb. | 83 ——— |

These are parasitical plants, called by the Assamese *Rogoo Mulla*. There is a vast variety of them in Assam.

Melastomaceæ.

- | | |
|------------------------|--------------------------------------|
| Melastoma, Linn. | • 4 other species from No. 85 to 88. |
| 48 Malabathrica, Linn. | |

These are highly ornamental, free-flowering plants, very abundant in Assam, called by the natives, *Phoot-kofa*.

Myrtaceæ.

Psidium, Linn.	97 Alba, W. and A.
89 Pomiferum, Linn.	Punica, Linn.
90 Species.	98 Granatum, Linn.
Syzygium, Gaert.	Barringtonia, Forst.
91 Jambolanum, D. C.	99 Acutangula, Gaert.
92 Fruticosum, D. C.	100 Racemosa, Roxb.
93 Nervosum, D. C.	Careya, Roxb.
Jambosa, Rumph.	101 Arborea, Roxb.
94 Malaccensis, D. C.	Engenia, Linn.
95 Vulgaris, D. C.	102 Corymbosa, Linn. ?
96 Agnea, D. C.	103 Species.

The Guava, called *Mudhriam*, and the black *Jamrool Jamoo*, are exceedingly plentiful in the jungles: the Malacca *Jamrool*, called here *Amrool tinga*, is also very common. The Pomegranate in gardens.

Cucurbitaceæ.

Cucumis, Linn.	117 Dioica, Roxb.
104 Melo, Linn.	118 Peteroclitia, Roxb.
105 Momordica, Roxb.	119 Lobata, Roxb.
106 Sativus, Linn.	Cucurbita, Linn.
107 Pubescens, Willd.	120 Citrullus, Linn.
108 Utillissimus, Roxb.	121 Pepo, Linn.
Luffa, Cav.	122 Lagenaria, Linn.
109 Acutangula, Roxb.	123 Alba, Roxb.
110 Pentandra, Roxb.	124 Species.
Bryonia, Linn.	Momordica, Linn.
111 Scabrella, Linn.	125 Charantia, Linn.
112 Umbellata, H. M.	126 Mixta, Roxb.
113 Amplexicaulis, Linn.	127 Muricata, Roxb.
114 Species.	128 Species.
115 ———	129 ———
Trichosanthes, Linn.	180 ———
116 Anguina, Linn.	

This is a very useful tribe of plants in Assam; is very plentifully distributed, and very generally cultivated. There are several other species, or varieties, besides those here enumerated.

Cactaceæ.

Opuntia, Haw.

131 *Vulgaris*, Haw.

Nagphunee, Bengal.

This plant is not uncommon on the sites of old villages, but I cannot learn that the cochineal insect has ever been fed on it in Assam.

Begoniaceæ.

Begonia, Linn.

134 Species.

132 *Malabarica*, Roxb.

135 ———

133 *Laciniata*, Roxb.

136 ———

Herbaceous flowering plants, the stalks of the leaves eagerly eaten by the natives.

Cruciferaæ.

Brassica, Linn.

Sinapis, Linn.

137 *Oleracea*, Linn.

140 *Dichotoma*, Roxb.

138 *Rapa*, Linn.

141 *Divaricata*, Roxb.

Raphanus, Linn.

139 *Sativus*, Linn.

With the exception of a few species of Mustard, this order is but sparingly distributed in Assam. The Cabbage, Radish, Turnip, and Cauliflower have been lately introduced; but are very successfully cultivated. Good seed might be grown here to supply the Calcutta market.

Capparidaceæ.

Cleome, Linn.

Capparis, Linn.

142 *Monophylla*, Linn.

145 *Horrida*, Linn. ?

Polansia, Rafin.

Cynandropsis, D. C.

143 *Icosandra*, W. and A.

146 *Pentaphylla*, D. C.

Roydsia, Wall.

147 *Cleome*.

144 Species.

These plants are either ornamental, or curious; *G. pentaphylla*, is called *Hoorhooria* by the natives.

Violaceæ.

Viola, Linn.

148 Species.

149 Species.

Violets are very common, only met with in the cold season, although they have not much scent.

Samydaceæ.

Casearia, Jacq.

150 *Glabra*, Boott ?

152 Species.

151 *Vareca*, Roxb.

Ornamental trees or shrubs, called *Shagellidoori*.

Papayaceæ.

Carica, Linn.

153 *Papaya*, Linn.

Cultivated.

Flacourtiaceæ.

Flacourtia, L'Herit.

Choulmoogra, Roxb.

154 *Cataphracta*, Roxb.

156 *Odorata*, Roxb.

155 *Inermis*, Roxb. ?

The *Paniali*, of Bengal, is occasionally met with in villages. The *C. odorata*, *Lemtem*, is very common near the hills.

Guttiferæ.

Garcinia, Linn.

Xanthochymus, Roxb.

157 *Camboogia*, Desv.

160 *Dulcis*, Roxb.

158 *Lanceæfolia*, Roxb.

161 *Pictorius*, Roxb.

159 *Purpurea*, Roxb.

Mesua, Linn.

162 *Ferrea*, Linn.

These are all very ornamental trees. The *Garcineæ* are called *Tekera*, *Xanthochymæ* *Tapar*, and *M. ferrea* *Nahor*; this last produces very durable timber, and on the hills grows much larger than in the plains. The seeds produce oil.

Ternstræmiaceæ.

Camellia, Linn.

Thea, Linn.

163 Species.

164 *Viridis*, Linn.

The Tea plant called *Phlap*, and *Khláp* by the Assamese, is but thinly scattered over that portion of the valley to which these observations refer, the aggregate of all the little patches occupied by indigenous Tea would not exceed 2000 acres. The Camellia, No. 163, is called *Misa Phlap* in Muttock, in this part of the district *Heelkat*.

Aceraceæ.

Acer, Linn.

165 Oblongum, Wall. ?

Ornamental.

Sapindaceæ.

Cardiospermum, Linn.

172 Dulcis, Jack ?

166 Halicacabum, Linn.

Nephelium, Linn.

Schindelia, Linn.

173 Longana, Linn.

167 Serrata, D. C.

Melicocca, Linn.

Sapindus, Linn.

174 Bijuga, Linn.

168 Detergens, Roxb.

Millingtonia, Roxb.

169 Saponaria, Linn. ?

175 Simplicifolia.

170 Fruticosus, Roxb.

176 Pinnata, Roxb.

Pierardia, Roxb.

171 Sapida, Roxb.

Of this order, the most important to the Assamese, is *P. sapida*, yielding a pleasantly subacid fruit, called *Letckoo*. No. 169, comes from near the hills; it may not be the true *Saponaria*: the natives use the fruit as a substitute for soap.

Hippocastanaceæ.

Æsculus, Linn.

177 Species.

This is a very ornamental plant when in flower; compared with specimens of *Æ. punduana*, Wall. from the Botanic Garden not in flower, it appears to be the same: it is widely distributed. I found it on the banks of the Soobhan Siri, banks of the Dikho, banks of the Booree Dihing, banks of the Desang, and on the banks of the Suffry.

Polygalaceæ.

Polygala, Linn.

• *Securidaca*, Linn.

178 Arvensis, Willd.

179 Paniculata, Linn.

S. paniculata is widely distributed, and very ornamental.

Linaceæ.

- | | |
|---------------------------------|----------------------------------|
| <i>Linum</i> , Linn. | 181 <i>Trigynum</i> , Roxb. |
| 180 <i>Tetragynum</i> , Coleb ? | 182 <i>Usitatissimum</i> , Linn. |

The first two are pretty, free-flowering plants ; the flax has been introduced by the Assam Company.

Sterculiaceæ.

- | | |
|---------------------------------|-----------------------------------|
| <i>Sterculia</i> , Linn. | <i>Abroma</i> , Linn. |
| 183 <i>Coccinea</i> , Roxb. | 192 <i>Angusta</i> , Linn. |
| 184 <i>Villosa</i> , Roxb. | <i>Commersonia</i> , Forst. |
| 185 <i>Angustifolia</i> , Roxb. | 193 <i>Echinata</i> , Forst. |
| 186 <i>Balanghas</i> , Linn. | <i>Byttneria</i> , Læf. |
| 187 <i>Lanceæfolia</i> , Roxb. | 194 <i>Aspera</i> , Coleb. |
| 188 <i>Species</i> . | 195 <i>Pilosa</i> , Roxb. |
| <i>Bombax</i> , Linn. | 196 <i>Catalpæfolia</i> , Jacq. ? |
| 189 <i>Malabaricum</i> , D. C. | <i>Pterospermum</i> , Sch. |
| <i>Pentapetes</i> , Linn. | 197 <i>Lanceæfolium</i> , Roxb. |
| 190 <i>Phœnicea</i> , Linn. | <i>Sterculia</i> , Linn. |
| <i>Kydia</i> , Roxb. | 198 <i>Species</i> ? |
| 191 <i>Calycina</i> , Roxb. | |

Some of these grow to an immense size ; blankets are made of the cotton which envelopes the seed of the *Bombax*, or *Himool*. Boats are made of the trunk of this tree but they are not durable. The bark of *Oodal*, *S. villosa*, is in great demand among the elephant catchers.

Malvaceæ.

- | | |
|---------------------------------|-----------------------------------|
| <i>Malva</i> , Linn. | 206 <i>Retusa</i> , Linn. |
| 199 <i>Rotundifolia</i> , Linn. | 207 <i>Rhombifolia</i> , Wall. |
| 200 <i>Species</i> . | 208 <i>Species</i> . |
| <i>Urena</i> , Linn. | <i>Abutilon</i> , Moench. |
| 201 <i>Lobata</i> , Linn. | 209 <i>Indicum</i> , Don. |
| 202 <i>Rigida</i> , Wall. | 210 <i>Species</i> . |
| 203 <i>Sinuata</i> , Linn. | 211 <i>Moschatus</i> , Moench. |
| <i>Sida</i> , Linn. | <i>Abelmoschus</i> , Med. |
| 204 <i>Species</i> . | 212 <i>Esculentus</i> , W. and A. |
| 205 <i>Polyandra</i> , Roxb. | |

<i>Gossypium</i> , Linn.	217 Species.
213 <i>Acuminatum</i> , Roxb.	218 <i>Scandens</i> , Roxb.?
214 Species.	219 <i>Rosa-sinensis</i> , Linn.
<i>Hibiscus</i> , Linn.	220 Species.
215 <i>Macrophyllus</i> , Roxb.	221 ———
216 <i>Pentaphyllus</i> , Roxb.	222 ———

These are for the most part ornamental plants. *Gossypium*, the cotton, is very generally cultivated, though in a rather slovenly manner; the seed is sown broadcast, the plants come up very thick, and starve each other. The variety which is cultivated by some of the Hill tribes is much smaller than that of the plains, being when at maturity not more than one foot in height.

Dipteraceæ.

Shorea, Roxb.

223 *Robusta*, Roxb.

This, the *Sal* or *Hal* of the Assamese, is the only tree I have to place here at present, specimens have been brought to me from *Sang Mai Habbi*. I have frequently heard of the *Makai*, the *Hoollung*, and several other large resinous trees which, I presume, belong to this order.

Elæocarpaceæ.

<i>Elæocarpus</i> , Linn.	226 <i>Aristatus</i> , Roxb.
224 <i>Lucidus</i> , Roxb.	227 Species.
225 <i>Rugosus</i> , Roxb.	

Ornamental trees, producing an acid fruit called *Naga Tinga*, and the *Roodrack*, highly prized for beads by the Hindoos.

Tiliaceæ.

<i>Corchorus</i> , Linn.	<i>Triumfetta</i> , Linn.
228 <i>Acutangulus</i> , Linn.	233 <i>Oblonga</i> , Wall.
229 <i>Capsularis</i> , Linn.	234 <i>Ovata</i> , Wall.?
230 <i>Olitorius</i> , Linn.	235 <i>Trilocularis</i> , Roxb.
231 <i>Trilocularis</i> , Linn. •	<i>Grewia</i> , Linn.
232 Species.	236 <i>Orientalis</i> , Linn.

237 Tomentosa, Juss.	242 Species.
238 Lanceæfolia, Roxb.	243 ———
239 Columnaris, Smith.	244 ———
240 Pumilis, Wall.	245 ———
241 Species.	246 ———

Several species of the genus *Corchorus* are very common, but I have never seen any under cultivation; the hemp, *Pat*, or *Murra Pat* sold in the bazars, is procured from Bengal.

Salicariæ.

Lawsonia, Linn.	249 Indica, Linn.
247 Inermis, Linn.	250 Reginæ, Roxb.
Lagerstrœmia, Linn.	251 Species.
248 Grandiflora, Roxb.	

I know not if No. 247 differs from *L. alba*, Lam, and W. and A.; the petals of all the flowers that I have seen are bright yellow. *L. grandiflora*, *Kukum*, a native of Chittagong, is common here, I found it growing to an immense size in the brickwork of the old palace at Gurgaon, and have seen it on the first range of hills. *L. Reginæ*, *Asar*, is a first-rate timber tree. No. 251 is probably *L. elegans*, Wall.; but I have not a description of Dr. Wallich's plant. *L. Indica* was introduced from the Botanic Garden.

Meliacæ.

Amoora, Roxb.	Aglaia, Lour.
252 Cucullata, Roxb.	254 Odorata, Lour.
Guarea, Linn.	255 Undulata, Wall.
253 Binectarifera, Roxb.	Melia, Linn.
	256 Species.

G. binectarifera, *Bondur Demoora*, is a very common plant; both species of *Aglaia* were introduced from the Botanic Garden. I have heard of the *Neem*, *Azadirachta Indica*, being found in villages, I suppose introduced.

Cedrelacæ.

Cedrela, Linn.	* <i>Poma</i> , Assamese.
257 Toona, Roxb.	

Very fine specimens of the Toon are to be met with; it makes fine boats.

Aurantiaceæ.

Triphasia, Lour.	265 Pentaphylla, D. C.
258 Trifoliata, D. C.	Feronia, Corr.
Limonia.	266 Elephantum, Corr. ?
259 Species.	Ægle, Corr.
260 ———	267 Marmelos, Corr.
261 ———	Citrus, Linn.
Bergera, Kon.	268 Acida, Roxb.
262 Integerrima, Roxb.	269 Aurantium, Linn.
263 Konigii, Roxb.	270 Medica, Linn. ?
Glycosmis, Corr.	271 Species.
264 Citrifolia, W. and A.	

Of the genus *Citrus*, there is an immense variety, distributed all over the country, on the banks of rivers chiefly. Nothing appears so agreeable to the Assamese palate as acid fruits, called by them *Tinga*. Messrs. Wight and Arnott observe that *B. integerrima*, Roxb. is a species of *Micromelum*.

Spondiaceæ.

Spondias, Linn.	273 Mangifera, Roxb. <i>Amra</i> .
272 Acuminata, Roxb.	274 Species.

The *Amra* is common, both on the hills and in the plains, and eagerly eaten.

Rhamnaceæ.

Ceanothus, Linn.	Zizyphus, Tourn.
275 Nepalensis, Wall. ?	278 Jujube, Lam.
Hovenia, Thunb.	Colubrina, Rich.
276 Inæqualis, D. C. ?	279 Asiatica, Brong.
Ventilago, Gært.	
277 Madraspatana, Gært.	

The Jujube, *Boghori*, is one of the most common plants, and the fruit is much sought after.

Euphorbiaceæ.

Sarcococca, R. Br.	Adelia, Linn.
280 Pruniformis, R. Br.	301 Nereifolia, Roxb.
Bradlica, Gært.	Phyllanthus, Linn.
281 Amoena, Wall. ?	302 Incanus, Wall. ?
282 Multilocularis, Roxb.	303 Patens, Roxb.
283 Lanceolaria, Roxb.	304 Retusus, Roxb.
Emblica, Gært.	305 Strictus, Roxb.
284 Officinalis, Gært.	306 Trinervia, Wall. ?
Andrachne, Linn.	307 Vitis-idea, Roxb.
285 Trifoliata, Roxb.	308 Species.
Dalechampia, Linn. ?	309 ———
286 Species ?	310 ———
287 ——— ?	311 ———
288 ——— ?	Rottlera, Roxb.
Excoecaria, Linn.	312 Barbata, Wall. ?
289 Agallocha, Linn.	313 Tetracoea, Roxb.
Sapium, Jacq.	314 Tinctoria, Wall. ?
290 Sebiferum, Roxb.	315 Tricocca, Wall. ?
Cluytia, Linn.	316 Species.
291 Collina, Roxb.	317 Peltata, Roxb.
292 Oblongifolia, Roxb.	Ricinus, Linn.
293 Scandens, Willd.	318 Communis, Linn.
Briedelia, Willd.	319 Species.
294 Attenuata, Wall. ?	Janipha, Kunth.
295 Lanceæfolia, Roxb.	320 Manihot, Kunth ?
Croton, Linn.	Jatropha, Linn.
296 Drupacium, Roxb.	321 Curcas, Linn.
297 Elæcocarpifolium, Wall.	Euphorbia, Linn.
298 Janfra, Roxb.	322 Chamæsyce, Lam. ?
299 Oblongifolium, Roxb.	323 Hirta, Jacq.
300 Tigilium, Linn.	324 Tirucalli, Linn.
	325 Species.

Of this order several plants are of prime importance to the Assamese. The fruit of *E. officinalis*, *Amlooki*, is eagerly eaten; the wood of *A. trifoliata*, *Ooriam*, is much used in building, and is very plentiful. *C. tigilium*, *Koni-bih*, is

common in all villages, and made use of in poisoning fish: the Rottleræ are esteemed for firewood, especially *R. pel-tata*? *Jugguroo*. *R. communis*, *Era*, grows wild, and is cultivated, but only for feeding the worm which produces the *Eria* silk. *Janipha manihot*? *Gosh alloo*, is often used for hedges, and is not unfrequent in the jungles near the hills; it does not appear to have any poisonous qualities in a green state as the Assamese eat the root eagerly when raw.

Celastrineæ.

Celastrus, Linn.	336 Species.
326 Montana, Roxb.	337 ———
327 Nutans, Roxb.	338 ———
328 Latifolia, Wall. ?	339 ———
329 Species.	Hippocratea, Linn.
330 ———	340 Indica, Willd.
Euonymus, Linn.	341 Vinimea, Wall. ?
331 Glabra, Roxb.	Salacia, Linn.
332 Scandens ?	343 Longifolia, Wall.
333 Species.	344 Species.
334 ———	345 ———
335 ———	346 ———

These are ornamental, or curious plants with inconspicuous flowers.

Malpighiaceæ.

- Hiptage, Gært.
347 Madablota, Gært.

This is a very ornamental plant, producing numerous fragrant flowers.

Tamaricineæ.

- Tamarix, Linn.
348 Indica, Willd. ?

Common on the sandbanks of the Brahmapootra, though I have seen no large trees in the plains.

Illecebraceæ.

- | | | |
|-----------------------|---|------------------------|
| Pharnaceum, Linn. | • | Molluga, Linn. |
| 349 Pentagynum, Roxb. | | 350 Pentaphylla, Linn. |

These are small plants, weeds.

Xanthoxylaceæ.

Todalia, Juss.

Xanthoxylum, Linn.

351 Aculeata, Pers.

352 Podacarthum, Wall. ?

353 Species.

Generally thorny plants, with aromatic, pungent leaves and berries.

Balsaminaceæ.

Impatiens, Linn.

355 Species.

354 Species.

356 ———

Of this genus there are many varieties, or species; the common annual English Balsam thrives here in the rains.

Oxalidaceæ.

Averrhoa, Linn.

Oxalis, Linn.

357 Carambola, Linn.

355 Sensitiva, Linn.

359 Species.

The first of these, the *Kamruna* of Bengal, here called *Korja tinga*, is a great favorite with the natives. I have met with some very large trees of it.

Rosaceæ.

Rosa, Linn.

Amygdalus, Linn.

360 Species.

364 Vulgaris, Hort.

Rubus, Linn.

Photinia, Lindl.

361 Gracilis, Roxb. ?

365 Species.

362 Rugosus, Smith.

366 ———

363 Hexagonus, Roxb.

Of wild Roses I have not met with any great variety; such as have been introduced into gardens from Bengal succeed remarkably well, and blossom freely. Of Raspberries, there is a greater variety, called *Jetooli poka*, but none of them very palatable; the common rough-skinned Peach is found in most villages, both in the plains and on the hills.

Leguminosæ.

Abrus, Linn.

Azacia, Neck.

367 Precatorius, Linn.

368 Arabica, Willd. ?

- 369 Pennata, Willd.
 370 Speciosa, Willd.
 371 Stipulata, D. C.
 Arachis, Linn.
 372 Hypogæa, Linn.
 Bauhinia, Linn.
 373 Acuminata, Linn.
 374 Purpurea, Linn.
 375 Triandra, Roxb.
 376 Variegata, Linn.
 Butea, Roxb.
 377 Frondosa, Roxb.
 Cæsalpinia, Linn.
 378 Digynia, Roxb.
 379 Species.
 Cajanus, D. C.
 380 Indicus, Spreng.
 Cathartocarpus, Pers.
 381 Fistulus, Pers.
 Clitoria, Linn.
 382 Ternatea, Linn.
 Cassia, Linn.
 383 Alata, Linn.
 384 Occidentalis, Linn.
 385 Sophora, Linn.
 386 Tora, Linn.
 387 Bicapsularis, Linn.
 388 Toroides, Roxb.
 389 Dimidiata, Roxb.
 Crotalaria, Linn.
 390 Bialata, Roxb.
 391 Stricta, Roxb.
 392 Verrucosa, Linn.
 393 Ramosissima, Roxb.
 394 Tenuifolia, Roxb.
 395 Species.
 396 ————
- Dalbergia, Linn.
 397 Emarginata, Roxb.
 398 Marginata, Roxb.
 399 Rimosa, Roxb.
 400 Zeylanica, Roxb.
 401 Ougeinensis, Roxb.
 402 Species.
 403 ————
 404 ————
 405 ————
- Glycine, Linn.
 406 Species.
 Desmodium, Desv.
 407 Gyranis, D. C.
 408 Latifolium, D. C.
 409 Polycarpum, D. C.
 410 Triflorum, D. C.
 411 Triquetrum, D. C.
 412 Cephalotes, Wall.
 413 Gyroides, D. C.
 Dicerma, D. C.
 414 Pulchella, D. C.
 Dolichos, Linn.
 415 Glutinosus, Roxb.
 416 Pilosus, Roxb.
 417 Mollissimus, Wall.?
 418 Rotundifolius, Volh.
 419 Catjan, Linn.
 420 Species.
 Erythrina, Linn.
 421 Glauca, Linn.
 422 Stricta, Roxb.
 Flemingia, Roxb.
 423 Strobilifera, R. Br.
 424 Stricta, Roxb.
 Inga, Plum.
 425 Bigesina, Willd.

- | | |
|-------------------------|---------------------------|
| 426 Umbellata, Wild. | Lathyrus, Linn. |
| Jonesia, Roxb. | 443 Sativus, Linn. |
| 427 Asoca, Roxb. | Myroneurum, Desf. |
| Robinia, Linn. | 444 Cuculatum, W. and A. |
| 428 Ferruginea, Roxb. | Pongamia, Linn. |
| 429 Fruticosa, Roxb. | 445 Glabra, Vent. |
| 430 Macrophylla, Shreb. | 446 Uliginosa, D. C. |
| Smithia, Ait. | Psoralia, Linn. |
| 431 Aspera, Roxb. | 447 Coryliflora, Linn. |
| Tamarindus, Linn. | Pterocarpus, Linn. |
| 432 Indica, Linn. | 448 Dalbergioides, Roxb. |
| Tephrosia, Pers. | Rhynchosia, Lour. |
| 433 Candida, D. C. | 449 Madicaginea, D. C. |
| Uraria, Desv. | Phaseolus, Linn. |
| 434 Campanulata, Wall. | 450 Radiatus, Linn. |
| 435 Crinita, Desv. | 451 Rostratus, Wall. |
| 436 Lagopoides, D. C. | 452 Truncatus, Linn. |
| 437 Picta, Desv. | 453 Alatus, Linn. |
| 438 Floribunda, Wall. | Judigofera, Linn. |
| Canavalia, Adans. | 454 Tinctoria, Linn. |
| 439 Gladiata, D. C. | Hedysarum, Linn. |
| 440 Virosa, W. and A. | 455 Species. |
| Guilandina, Linn. | 456 ——— |
| 441 Bonduc, Willd. | Vachellia, W. and A. |
| Lablab, Adans. | 457 Farnesiana, W. and A. |
| 442 Vulgaris, Savi. | |

These consist of immense timber trees, eminently ornamental flowering shrubs, elegant climbers, and herbaceous pulse-bearing plants. *A. hypogæa*, the earth-nut, I have seen only in a few gardens; I presume it has been lately introduced from the Botanic Garden. The different kinds of *Dolichos* and *Canavalia*, *Scem* of Bengal, are plentiful, and occasionally cultivated. *C. Indicus*, *Urhur*, is also cultivated, as is *P. radiatus*? *Mas kulai*,—*Matti ma* of the Asamese: sown in October or early in November. All the kinds of English Peas and French Beans succeed remark-

ably well till comparatively late in the season. French Beans plentiful to the end of May, and might be produced in every month in the year, with proper attention. Abundance of seed Peas could be grown in Assam, if required for the Calcutta Market.

Connaraceæ.

Connarus, Linn.

Cnestis, Jack.

458 Nitidus, Roxb.

459 Monadelpha, Roxb.

Curious and ornamental plants.

Crassulaceæ.

Kalanchoe, Adans.

460 Laciniata, D. C.

A curious herbaceous plant.

Anacardiaceæ.

Semicarpus, Linn.

Rhus, Linn.

461 Anacardium, Linn.

465 Bucku Amela, Roxb.

462 Cuneifolium, Roxb.

466 Juglandifolia, Hen.

Penduliflora, Wall.

467 Vernix, Linn.

Mangifera, Linn.

Phlebochiton, Wall.

463 Indica, Linn.

468 Extensum, Wall.

The Mango, *Am*, is very common in villages, and often to be met with in the jungles; the fruit often infested with insects. This order yields the famous varnish *Ahom Etha*, reported to be produced by *Melanorrhæa usitata*, Wall. This I have not yet met with in Assam; the plant which has been invariably pointed out to me as the "*Ahom Etha*," is a species of *Rhus*, and what may be *R. vernix*.

Cupuliferaæ.

Quercus, Linn.

Castanea, Gært.

469 Species.

470 Species.

471 ———

Chestnut trees are very common in the plains, and Oaks plentiful on the hills.

Urticaceæ.

<i>Urtica</i> , Linn.	510 <i>Macrophylla</i> , Desf.
472 <i>Alienata</i> , Roxb.	511 <i>Religiosa</i> , Linn.
478 <i>Crenulata</i> , Roxb.	512 <i>Retusus</i> , Willd.
474 <i>Macrostachya</i> , Wall. ?	513 <i>Scandens</i> , Roxb.
475 <i>Penduliflora</i> , Wall. ?	514 <i>Jewry</i> , Griff. ?
476 <i>Pulcherrima</i> , Roxb.	515 <i>Peterophylla</i> , Linn.
477 <i>Pentandra</i> , Roxb.	516 <i>Excelsa</i> , Vahl.
478 <i>Scabrella</i> , Roxb.	517 <i>Nitida</i> , Thunb.
479 <i>Subperforata</i> , Wall.	518 <i>Oppositifolia</i> , Roxb.
480 <i>Nivea</i> , Linn.	519 <i>Lanceæfolia</i> , Ham.
481 <i>Pulchella</i> , Linn. ?	520 <i>Longifolia</i> , Wall. ?
19 Other species, from No.	521 <i>Scabrida</i> , Wall. ?
482 to 500.	522 <i>Virgata</i> , Roxb.
<i>Canabis</i> , Linn.	12 Other species, from No.
501 <i>Sativa</i> , Linn.	523 to 534.
<i>Morus</i> , Linn.	<i>Artocarpus</i> , Forst.
502 <i>Atropurpurea</i> , Roxb.	535 <i>Integrifolius</i> , Linn.
503 <i>Alba</i> , Linn. ?	536 <i>Lakoocha</i> , Roxb.
<i>Broussonetia</i> , Vent.	<i>Batis</i> , Linn.
504 <i>Papyrifera</i> , Vent.	537 <i>Aurantiaca</i> ?
505 <i>Assamica</i> , Wall.	<i>Trophis</i> , Linn.
<i>Ficus</i> , Linn.	538 <i>Aspera</i> , Retry.
506 <i>Cordifolia</i> , Roxb.	<i>Ceratophyllum</i> , Linn.
507 <i>Elastica</i> , Roxb.	539 <i>Verticillatum</i> , Roxb.
508 <i>Hirta</i> , Roxb.	<i>Bæhmeria</i> , Linn.
509 <i>Indica</i> , Vahl.	540 <i>Vininea</i> ?

Assam may be considered the garden of Nettles and Fig trees. These abound in every part of it, some of them are eminently ornamental, some eminently useful, and some emi-

ing
ese
not
red

by the slightest possible touch of, the little white berries on my chin, and the back of my hand. *U. nivea*, *Rheca*, is cul-

tivated by the fishermen for making their nets. *B. papyrifera* was lately introduced from the Botanic Garden. Dr. Wallich sent me up some cuttings by dâk, and also some cuttings of the *M. multicaulis*, which grow freely. *B. Assamica* is abundant in Muttock; it makes a very strong, serviceable paper. The *Kant'hal*, *A. integrifolius*, is so plentiful, that it is daily felled for building purposes; as is the *Sam*, *A. chaplasha*.

Ulmaceæ.

Celtis, Linn.

541 *Orientalis*, Linn.

3 Other Species, to No. 544.

These are free-growing ornamental plants, springing up very thick on fresh cleared ground.

Stilaginaceæ.

Stilago, Linn.

Antidesma, Linn.

545 *Bunias*, Linn.

547 *Paniculata*, Roxb.

546 *Diandra*, Roxb. ?

548 Species.

The first two, called *Helos*, grow to be considerable trees; the latter two, *Pani-Helos*, are of smaller growth: all produce a profusion of small sub-acid berries, which are eagerly eaten by the natives.

Myriceæ.

Putranjiva, Wall.

549 *Roxburghii*, Wall.

This plant is widely distributed; the wood is valuable, but I have not hitherto met with any very large trees.

Juglandææ.

Juglans, Linn.

550 Species.

Walnuts have been brought to me from the Naga hills, but I have not seen any trees in the plains producing edible fruit.

Piperaceæ.

Piper, Linn.

554 Species.

551 *Betle*, Linn.

555 ———

552 *Chuvya*, Roxb. •

556 ———

553 *Longum*, Linn.

The *Pan*, of which so much is consumed by the Assamese, is very little cultivated in the plains; the Bazars in this district are supplied principally by the Nagas, who cultivate, or rather grow it on the slopes, and at the foot of their Hills.

Elæagneacæ.

Elæagnus, Linn.

557 *Conferta*, Roxb.

An ornamental, though straggling shrub, with silver coloured scales.

Aquilariacæ.

Aquilaria, Lam.

558 *Agallocha*, Roxb.

This large, erect growing tree is plentiful, and called *Hansi*; the bark may be stripped off in large pieces without much injury to the plant: it is used to write on, and for various other purposes, and makes a very strong and durable paper.

Lauracæ.

Cinnamomum, R. Br.

564 *Macrophylla*, Roxb.

559 *Cassia*, Don.

565 *Nitida*, Roxb.

560 *Obtusifolium*, Nees ?

566 *Roxburghii*, Nees.

Laurus, Plin.

567 *Lanceæfolia*, Roxb.

561 *Bilocularis*, Roxb.

568 *Fasciculata*, Wall. ?

562 *Species*.

569 *Oblongifolia*, Wall. ?

Tetranthera, Jacq.

570 *Soom*.

563 *Bifaria* ?

571 to 574, *Species*.

Several species, or varieties of Cinnamon, or *Laurus*, are met with near the hills; but I have no good description of these three Genera to enable me to distinguish the different species. The most important to the Assamese is the *Soom*, with the leaves of which the *Moonga* Silk-worm is fed.

Aristolochiæ.

Aristolochia, Linn.

575 *Indica*, Linn.

A curious, climbing plant. Introduced ?

Amaranthaceæ.

Deeringia, R. Br.	583 Cernua, Roxb.
576 Celosioides, Roxb.	Achyranthes, Linn.
Amaranthus, Linn.	584 Aspera, Linn.
577 Caudatus, Linn.	585 Lapacea, Roxb.
578 Tristis, Roxb.	586 Triandra, Roxb.
579 Paniculatus, Linn.	587 Species.
580 Spinosa, Roxb.	588 ———
Celosia, Linn.	Desmochæta, D. C.
581 Argentea, Roxb.	589 Velutina, Wall. ?
582 Cristata, Roxb.	

Common herbaceous plants, or weeds; the *Amaranthææ* are used as pot herbs. *Hak.*

Chenopodiaceæ.

Basella, Linn.	591 Rubra, Linn.
590 Alba, Linn.	

These two species or varieties, are cultivated occasionally; *Pooe-hak*, or *Porooi-hak*. But there is a wild variety, *Horoo Porooi*, which is very common near the hills, and is a great favorite with the natives. *Chenopodia viride*, *Jilliy-milly*, is also common, and eaten.

Phytolaceæ.

Bivina, Linn.
592 Lævis, Linn.

An ornamental flowering plant, found in gardens; probably introduced from the Botanic Garden.

Polygonaceæ.

Polygonum, Linn.	597 Perniculatum, Wall. ?
593 Chinensis, Linn.	598 to 605. 8 other species.
594 Pilosum, Roxb.	Rumex, Linn.
595 Elegans, Linn.	606 Acutus.
596 Horridum, Buch.	607 Species.

This tribe is very plentiful; besides the above there are many other species. *P. Fagopyrum*, Buck-Wheat, is cultivated by some of the Hill people.

Nyctaginaceæ.

Mirabilis, Linn.

608 Jalapa, Linn.

Boerhaavia, Linn.

609 Species.

610 ———

The first of these, Marvel of Peru, is not unfrequently seen in villages.

Menispermaceæ.

Cocculus, D. C.

611 Acuminatus, D. C.

612 Cordifolius, D. C.

Menispermum, Linn.

613 Species.

614 Species.

Cissampelos, Linn.

615 Glabra, Roxb.

616 Hernandifolia, Wall. ?

617 Hexandra, Roxb.

These are trailing, climbing plants, with inconspicuous flowers ; the juice of *C. cordifolius*, *Anemeluta*, or *Hoogoonluta*, is taken inwardly for shortness of breath and cough.

Myrsinaceæ.

Myrsine, Linn.

618 Capitellata, Roxb.

619 Species.

Ardisia, Swartz.

620 Colorata, Roxb.

621 Floribunda, Wall. ?

622 Umbellata, Wall. ?

623 Pedunculosa, Wall.

624 Solanacea, Roxb.

625 Hymenandra, Wall.

Mæsa, Forst.

626 Nemoralis, Wall.

627 Species.

Common, ornamental flowering shrubs.

Sapoteæ.

Chrysophyllum, Linn.

628 Acuminatum, Roxb.

Mimusops, Linn.

629 Elengi, Linn.

The first of these, called *Bonpita*, yields an insipid, clammy fruit, eagerly eaten ; the other, *Bokhool*, small, fragrant flowers.

Ebenaceæ.

Diospyros, Linn.

630 Glutinosa, Koen.

631 Racemosa, Roxb.

632 Ramiflora, Roxb.

633 Stricta, Roxb.

634 Species.

Ornamental trees producing astringent fruit, and serviceable timber; the first, *Kendoo*, is the *Gab* of Bengal, and is used here also for paying boats.

Convolvulaceæ.

Argyreia, Lour.	643 Obscura, Chois.
635 Aggregata, Chois.	Convolvulus, Chois.
636 Argentea, Chois.	644 Paniculatus, Roxb.
637 Spinosa, Chois.	645 Turpethum, Roxb.
638 Splendens, Swt.	646 Viscidus ?
639 Species.	647 Marginatus, Linn.
Quamoclit, Tourn.	648 Vitifolius, Willd.
640 Coccinea.	649 Species.
Porana, Linn.	650 Obscurus, Willd.
641 Paniculata, Roxb.	different from 643 ?
Ipomæa, Chois.	651 Species.
642 Grandiflora, Roxb.	

All these are ornamental, free flowering, trailing, or climbing plants.

Lobeliaceæ.

Lobelia, Linn.	652 Robusta, Wall.
----------------	--------------------

An elegant, annual plant, with white flowers, common on the low hills in February.

Cinchonaceæ.

Nauclea, Linn.	Stylocoryna, Cor.
653 Cadamba, Roxb.	662 Webera, Rich.
654 Species.	Gardenia, Ellis.
Uncaria, Schneb.	663 Campanulata, Roxb.
655 Pilosa, Roxb.	664 Thunbergia, Linn. ?
656 Sessilefructus, Roxb.	Randia, Houst.
Mussaenda, Linn.	665 Decussata, Wall. ?
657 Corymbosa, Roxb.	666 Longispina, D. C.
658 Frondosa, Linn.	Vangueria, Comm.
659 Glabra, Vahl.	667 Spinosa, Roxb.
660 Macrophylla, Wall. ? *	Rondeletia, Plum.
661 Species.	668 Paniculata, Roxb.

669 <i>Tinctoria</i> ?	681 <i>Indica</i> , Linn.
<i>Morinda</i> , Vaill.	682 <i>Tomentosa</i> , Smith.
670 <i>Angustifolia</i> , Roxb.	<i>Coffea</i> , Linn.
671 <i>Exserta</i> , Roxb.	683 <i>Arabica</i> , Linn.
<i>Pæderia</i> , Linn.	684 <i>Bengalensis</i> , Roxb.
672 <i>Fœtida</i> , Linn.	<i>Psychrotia</i> , Linn.
<i>Ixora</i> , Linn.	685 <i>Macrophylla</i> , Wall. ?
673 <i>Bandhuca</i> , Roxb.	686 <i>Undata</i> , Jacq.
674 <i>Barbata</i> , Roxb.	687 <i>Grandiflora</i> , Wall. ?
675 <i>Brachiata</i> , Roxb.	688 <i>Species</i> ?
676 <i>Incarnata</i> , Roxb.	<i>Spermacoe</i> , Linn.
677 to 680, 4 species.	689 <i>Scabra</i> , Linn.
<i>Pavetta</i> , Linn.	690 <i>Teres</i> , Roxb.

These are for the most part, ornamental free-flowering shrubs, or small trees, widely distributed. *N. cadamba*, *Rhogoo*, is of larger growth, producing serviceable timber. The coffee has been introduced within the last six or seven years, and thrives remarkably well, planted under partial shade, on ground sufficiently elevated to allow the superfluous water to run off; no coffee plants could succeed better in any country, than a few that are now growing in Captain Brodie's garden at Seeksagur; they were seedlings, obtained from the Botanic Garden in 1839, and planted by Dr. F. Furnell, on the bank of the tank, exposed to the evening sun, but shaded in the fore part of the day. I consider the elevation, or slope of the ground, to be more essential to the success of coffee plantations in Upper Assam, than shade. Should it be the wish of the Company to extend the cultivation of coffee, plenty of ground may be found well adapted for the experiment at Gabhoroo Purbut, Che-reideo, or at Deopany, or any other place near the hills.

Compositæ.

<i>Artemisia</i> , Linn.	<i>Bidens</i> , Linn.
691 <i>Grata</i> , Wall.	693 <i>Chinensis</i> , Willd.
692 <i>Indica</i> , Willd.	694 <i>Wallichii</i> , D. C.

695 Tripartita, Roxb.	Eupatorium, Linn.
696 Decomposita, Wall.	715 Vagans ?
Cacalia, Linn.	Elephantopus, Cass.
697 Species.	716 Scaber, Linn.
698 ———	Hingsha, Roxb.
Centaurea, Linn.	717 Repens, Roxb.
699 Species*	Sonchus, Linn.
Chrysanthemum, Linn.	718 Oxiensis, Roxb.
700 Indicum, Willd.	719 Species.
Conyza, Linn.	Spilanthes, Jacq.
701 Angustifolia, Roxb.	720 Acnella, Wall. ?
702 Balsamifera, Linn.	Verbesina, Linn.
703 Læta, Wall.	721 Calendulacea, Willd.
10 Other species ? from	Xanthium, Tourn.
704 to 713.	722 Cordatum, Wall.
Eclipta, Linn.	723 Indicum, Roxb.
714 Prostrata, Linn.	

Chiefly herbaceous flowering plants, or useless weeds. Lettuces succeed well here, from October to May; and might be cultivated for seed to any extent, near the hills.

Plantaginaceæ.

Plantago, Linn.	725 Species ?
724 Attenuata, Wall.	
Common road-side plants.	

Plumbaginaceæ.

Plumbago, Linn.	727 Zeylanica, Roxb.
726 Rosea, Linn.	
Very pretty, free-flowering small shrubs.	

Cordiaceæ.

Cordia, Linn.	729 Species.
728 Myxa, Linn.	
Middling sized trees; wood soft, but useful.	

Ehretiaceæ.

Ehretia, Linn.	Heliotropium, Linn.
730 Lævis, Roxb.	732 Indicum, Roxb.
731 Serrata, Roxb.	

The first two called *Bual*, produce serviceable timber ; the latter is a common road-side plant, or weed.

Boraginæ.

Boraga, Linn.	Trichodesma, R. Br.
733 Indica, Roxb.	734 Zeylanica, R. Br.

Common road-side plants.

Labiata.

Ocymum, Linn.	744 Viscosa, Wall.
735 Sanctum, Linn.	745 Cana, Wall.
736 Gratissimum, Linn.	Lincas, R. Br.
737 Thyrasiflorum, Wall. ?	746 Species.
738 Species.	Phlomis, Linn.
Plectranthus, L'Herit.	747 Zeylanica, Willd.
739 Amethysticus, Roxb.	748 Esculenta, Roxb. ?
740 Rugosus ?	Ajuga, Linn.
Mentha, Linn.	749 Disticha, Roxb.
741 Perilloides, Roxb.	750 Fruticosa, Roxb.
742 Species.	Hyptis, Jacq.
Salvia, Linn.	751 Species.
743 Brachiata, Roxb.	752 Suaveolens ?
Scutellaria, Linn.	753 Species.

Common plants, generally with fragrant flowers or leaves. The English Lavender, Thyme, Mint, Sage and Marjorum, would probably succeed, and be very acceptable, especially to Europeans.

Verbenacæ.

Clerodendrum, Linn.	Callicarpa, Linn.
754 Glandulosum ?	764 Arborea, Roxb.
755 Hastatum, Wall. ?	765 Cana, Linn.
756 Infortunatum, Linn.	766 Dentata, Wall.
757 Serratum, Don.	767 Lanceolaria, Roxb.
758 Siphoranthus, R. Br.	768 Macrophylla, Roxb.
759 Trichotomum, Thun.	769 Purpurea, Juss.
760 to 763 Species.	770 Villosa, Roxb.

771 Species.	777 Negundo, Linn.
Premna, Linn.	Streptium, Roxb.
772 Esculenta, Roxb.	778 Asperum, Roxb.
773 Grandiflora ?	Verbena, Linn.
Vitex, Linn.	779 Species.
774 Heterophylla, Roxb.	780 ———
775 Incisa, Linn.	Lantana, Linn.
776 Leucoxylon, Linn.	781 Cammara ?

These are, for the most part, ornamental flowering shrubs ; a few yield serviceable timber. *V. negundo*, *Pasootia*, is common about villages ; an infusion of the leaves and young shoots is used in fomentations for a cold in the head, and also as poultice applied to wounds or swellings. *L. camara* ? has been lately introduced from the Botanic Garden.

Pedaliaceæ.

Sesamum, Linn.

782 Orientale, Linn.

This plant, *Teel*, is common about villages. I am not aware that the Assamese make any use of it.

Bignoniaceæ.

Bignonia, Linn.

783 Indica, Willd. *Bat Ghilla*.

784 Chelonoides, Willd. *Parooli*.

These are both common ; the wood of the first is soft, and of little value : the latter, *Parooli*, yields valuable timber.

Acanthaceæ.

Thunbergia, Linn.

785 Grandiflora, Roxb.

Ruellia, Linn.

786 Dependens, Roxb.

787, 788, 789, Species.

Strobilanthus, Blum.

790 Auriculata, Wall.

791 Sabiniana ?

792 Species.

Goldfussia, Nees.

793 Species.

Barleria, Linn.

794 Cristata, Linn.

795 Species.

796 ———

Phlogocanthus, Nees.

797 Curviflorus ?

798 Thyrsiflorus, Wall.

<i>Eranthemum</i> , R. Br.	805 <i>Pectinata</i> , Roxb.
799 <i>Pulchellum</i> , Wall. ?	3 Other species, from
800 <i>Strictum</i> , Roxb.	806 to 808.
<i>Iusticia</i> , Linn.	<i>Peristrophe</i> , Nees.
801 <i>Adhatoda</i> , Linn.	809 <i>Lanceolaria</i> , Wall. ?
802 <i>Betonica</i> , Vahl.	810 <i>Speciosa</i> , Wall. ?
803 <i>Citrifolia</i> ?	<i>Andrographis</i> , Wall.
804 <i>Ecbolium</i> , Roxb.	811 <i>Pedunculata</i> , Wall.

All very ornamental, free-flowering shrubs or small plants. The young tender shoots of several are eaten as *Hak* by the Assamese. *J. adhatoda*, *Boga tita*; and *P. thyrsiflorus*, *Bungatita*, this plant forms serviceable and ornamental hedges, growing 10 or 12 feet high: when kept properly pruned, it has an elegant appearance at the time of flowering.

Lentibulaceæ.

<i>Utricularia</i> , Linn.	813 Species.
812 <i>Fasciculata</i> , Roxb.	

Curious aquatic plants, producing yellow flowers, found plentifully swimming on the tank at Ligri Pookuri.

Gesneraceæ.

<i>Columnnea</i> , Linn.	815 <i>Heterophylla</i> , Roxb.
814 <i>Balsamica</i> , Linn.	

Small, herbaceous plants with reddish purple flowers, found in rice fields.

Scrophulariaceæ.

<i>Scoparia</i> , Linn.	<i>Capraria</i> , Linn.
816 <i>Dulcis</i> , Linn.	822 <i>Gratissima</i> , Roxb.
<i>Gratiola</i> , Linn.	823 <i>Diffusa</i> , Roxb. ?
817 <i>Reptans</i> , Roxb.	824 Species.
818 <i>Monniera</i> , Roxb. ?	<i>Torenia</i> , Linn.
819 Species.	825 <i>Hians</i> , Roxb.
820 ———	826 Species.
<i>Buddleia</i> , Linn.	9 Other species ? from
821 <i>Neemda</i> , Roxb.	827 to 835.

Chiefly small, herbaceous plants. *B. neemda*, is a very ornamental shrub, with numerous white, fragrant flowers.

Salanacæ.

Capsicum, Linn.	844 Tobacum, Linn.
836 Annum, Roxb.	Solanum, Linn.
837 Purpureum, Roxb.	845 Hirsutum, Roxb.
Physalis, Linn.	846 Pubescens, Willd.
838 Alkekingi, Linn.	847 Indicum, Linn.
839 Pubescens, Linn.	848 Jacquini, Willd.
Datura, Linn.	849 Longum, Roxb.
840 Fastuosa ?	850 Melongena, Linn.
841 Metel, Roxb.	851 Nigrum, Linn.
842 Lævis, Roxb.	852 Spirale, Roxb.
Nicotiana, Linn.	853 Species.
843 Quadrivalvis, Pursh.	

Capsicums, *Jalook*, Tobacco, *Dhopat*, and Brinjals *Bengana*, are the most important among these ; large quantities of *Capsicums* are brought down by the Nagas. To this family belongs the Potato, which succeeds remarkably well on elevated ground, and no doubt might be cultivated to considerable advantage on some of our low hills, not only for consumption in Assam, but also for the Calcutta market.

Gentianeæ.

Menyanthes, Linn.	Cristata, Roxb.
-------------------	-----------------

A curious aquatic plant with white flowers, found floating on still water.

Apocynacæ.

Echites, Linn.	Nerium, Linn.
855 Acuminata, Roxb.	863 Coccineum, Roxb.
856 Caryophyllata, Roxb. ?	864 Odorum, Roxb.
857 Paniculata, Poir.	865 Piscidium, Roxb.
858, 859, 860, Species.	Wrightia, R. Br.
Holarrhena, R. Br. *	866 Antidysenterica, R. Br.
861 Villosa ?	Alstonia, R. Br.
Parsonsia, R. Br.	867 Scholaris, R. Br.
862 Spiralis ?	

Plumeria, Linn.

868 Acuminata, Roxb.

Tabernamontana, Linn.

869 Crispa, Roxb.

Strychnos, Linn.

870 Nux-vomica, Linn.

Ophioxylon, Burm.

871 Serpentinum, Linn.

These are all highly ornamental shrubs, small trees, or climbers, often with fragrant flowers. *N. odorum*, *Kudmi Kurmi*, I have found about temples and villages only. The bruised leaves, root, or whole plant of *O. serpentinum* is applied to swellings of the face, or of any other part of the body, and supposed to have good effect. It is called *Arak-soon* by the Assamese.

Asclepiadaceæ.

Hoya, R. Br.

872 Carnosa, R. Br.

873 Macrophylla, Wight.

Marsdenia, R. Br.

874 Tinctoria, R. Br.

Pergularia, Linn.

875 Minor, H. K.

876 Species.

Calotropis, R. Br.

877 Gigantea, R. Br.

Hemidesmus, R. Br.

878 Species.

Sarcolobus, R. Br.

879 Carinatus, Wall.

Asclepias, Linn.

880 Amicata, Roxb.

881, 882, 883, Species.

Generally twining, milky, ornamental, free-flowering plants. *C. Gigantea*, *Akund*, I have seen about villages only.

Oleineæ.

Olea, Linn.

884 Dioica, Roxb.

Phillyrea, Linn.

885 Grandiflora, Wall.

Chionanthus, Linn.

886 Ramiflora, Roxb.

887 Zeylanica, Linn.

888 Macrophylla ?

Chondrospermum, Wall.

889 Smilacifolium, Wall.

890 Simplicifolium ?

Ornamental trees with minute flowers, generally more or less fragrant. The larger kinds produce good timber on the hills.

Jasmineæ.

- | | |
|-----------------------|-------------------------|
| Jasminum, Linn. | 894 Sambac. |
| 891 Bifarium ? | Nyctanthes, Linn. |
| 892 Bracteatum, Roxb. | 895 Arbortristis, Linn. |
| 893 Latifolium, Roxb. | |
- Ornamental, twining, flowering plants.

GYMNOSPERMÆ.

Equisetaceæ.

- | | |
|--------------------|--------------|
| Equisetum, Linn. | 897 Species. |
| 896 Debilis, Roxb. | |

Very curious plants, *Harkola Bori*, found on the sandbanks of the Brahmapootra, and other rivers. The whole plant well pounded in water, is applied to bruises, or broken bones.

ENDOGENÆ.

Scitamineæ.

- | | |
|--------------------------|-----------------------|
| Zingiber, Gart. | 906 Species. |
| 898 Casumunar, Roxb. | Alpinia, Linn. |
| 899 Species. | 907 Calcarata, Rosc. |
| Curcuma, Linn. | 908 Galanga, Swzt. |
| 900 Zanthorrhiza, Roxb. | 909 Allughas, Rosc. |
| 901 Species. | Costus, Linn. |
| 902 ——— | 910 Nepalensis, Rosc. |
| Amomum, Linn. | 911 Speciosus, Rosc. |
| 903 Angustifolium, Linn. | Globba, Linn. |
| Hedychium, Koen. | 912 Careyana, Roxb. |
| 904 Angustifolium, Roxb. | 913 Expansa, Wall. |
| 905 Coronarium, Roxb. | |

Herbaceous plants, often with elegant flowers, and stimulating roots. Ginger is not much cultivated in the plains, but is brought down in large quantities by the Nagas.

Marantaceæ.

- | | |
|------------------------|---------------------|
| Phrynium, Will. | Canna, Linn. |
| 914 Dichotomum, Roxb. | 916 Coccinea, Rosc. |
| Maranta, Linn. | 917 Indica, Linn. |
| 915 Arundinacea, Linn. | |

Very neat and useful mats are made of the stems *P. dichotomum*, *Pata Deo*. The Arrow-Root has lately been introduced.

Musaceæ.

- | | |
|--------------------------------|------------------------------|
| <i>Musa</i> , Linn. | 919 <i>Sapientum</i> , Linn. |
| 918 <i>Paradisiaca</i> , Linn. | 920 <i>Coccinea</i> , Andr. |

Numerous varieties of the Plantain, *Kob*, are to be met with in Assam; a good assortment of the best (about 2 var.) have been planted in the Company's grounds at Nazer. and Gurgaon; the cultivation of them is also encouraged at each of the factories.

Taccaceæ.

- Tacca*, Forst.
921 Species.

A very curious plant, with dark coloured flowers.

Irideæ.

- | | |
|------------------------------|-------------------------|
| <i>Pardanthus</i> , Kerr. | <i>Marica</i> , Schreb. |
| 922 <i>Chinensis</i> , Kerr. | 923 <i>Palmifolia</i> ? |

Pretty, flowering plants.

Bromeliaceæ.

- Ananassa*, Lindl.
924 *Sativa*, R. Br.

The Pine-apple, *Mattie Kanthal*, succeeds remarkably well in Assam, but little care is taken in the cultivation of it.

Hydrocharideæ.

- | | |
|-----------------------------|---------------------------------|
| <i>Damasonium</i> , Schreb. | <i>Valisneria</i> , Linn. |
| 925 <i>Indicum</i> , Willd. | 926 <i>Octandra</i> , Roxb. |
| | 927 <i>Alternifolia</i> , Roxb. |

Very curious aquatic plants.

Orchideæ.

- | | |
|-------------------------|------------------------------|
| <i>Arundinæ</i> , Blum. | <i>Pterygodium</i> , Swarzt. |
| 928 <i>Busifolia</i> . | 930 <i>Sulcatum</i> , Roxb. |
| <i>Vanda</i> , R. Br. | |
| 929 Species. | |

Curious herbaceous flowering plants growing on trees generally. To this tribe of plants belongs the celebrated

Vanilla aromatica, which has been sent me by Dr. Wallich and hitherto appears to do very well at Nazera. An extensive cultivation of this plant is highly desirable.

Palmae.

Corypha, Linn.	Areca, Linn.
931 Elata, Roxb.	936 Catechu, Linn.
Calamus, Linn.	937 Gracilis, Roxb.
932 Fasciculatus, Roxb.	Wallichia, Roxb.
933 Hostilis, Wall. ?	938 Caryotoides, Roxb.
934 Rotang, Willd.	Caryota, Linn.
Borassus, Schreb.	939 Urens, Roxb.
935 Flabelliformis, Linn.	

The most conspicuous plant among the Palms, is *A. catechu*, *Tamool*, the nuts of which the Assamese eat a tremendous quantity in a green state, with their *Pan*. The tree is used for ridge poles and rafters. *Corypha elata* has been introduced from the Botanic Garden. There are two plants of *B. flabelliformis* near the Gobinda Dole at Gurgaon; a few *Cocoanut* trees are occasionally to be found in villages. At Jorhath there are two *Date* trees, but I believe they never bear fruit. As an useful plant, *C. Rotang*, *Jatti Bet*, is second to none but the *Bamboo*; to the Assamese it is every thing in the way of line, cordage, wire and nails. The leaves of all the Palms are used for thatching, and those of a species of *Livistonia*, called *Toko pat*, are preferred for *Jhappeis* and *Syes*, or pats and covers to boats.

Liliaceae.

Asparagus, Linn.	942 Maculata, Roxb.
940 Racemosus, Willd.	Aloe, Linn.
Dracæna, Linn.	943 Perfoliata, Linn.
941 Ferrea, Linn.	

A. Racemosus is an ornamental twining plant, common; the other three I have seen about villages. The common *Asparagus* would no doubt do well here, and be much more productive than in Bengal.

Pontederææ.

Pontedera, Linn. 945 Hastata, Roxb.

944 Vaginalis, Roxb. 946 Dilatata, Roxb.

Succulent plants with blue flowers, growing in water, or in wet places, called *Meteka* by the Assamese, who take the fleshy part of the root with salt and pepper to expel phlegm

Commelineæ.

Commelina, Linn. 950 Erecta, Linn.

947 Bengalensis, Roxb. 951 Scapiflora, Roxb.

948 Cespitosa, Roxb. 8 other species, from No.

949 Communis, Roxb. 952 to 959.

Common weeds growing among grass in damp places generally with blue flowers.

Smilacææ.

Smilax, Linn. 961 Maculata, Roxb.

960 Macrophylla, Roxb. 962 Ovalifolia, Roxb.

Curious, prickly, climbing plants, with numerous minute flowers.

Dioscoreææ.

Dioscorea, Linn. 967 Pentaphylla, Linn.

963 Alata, Linn. 968 Rejibella, Roxb.

964 Globosa, Roxb. 969 Fasciculata, Roxb.

965 Anguina, Roxb. 970 Pulchella, Roxb.

966 Dæmona, Roxb. 7 other species, from
971 to 977.

Curious twining plants, with large, fleshy, edible tubers: *Yams, Alloo.*

Roxburghiaceæ.

Roxburghia, Dryan.

978 Viridiflora.

A curious twining plant, with green flowers.

Pandaneæ.

Pandanus, Linn. 981 Lucidus, Wall. ?

979 Fœtidus, Roxb. 982 Species.

980 Odoratissimus, Linn.

Very curious, thorny plants, *Bhiihilo kaint*. The leaves are used for thatching.

Aroideæ.

Arum, Linn.

986 Bulbiferum, Roxb.

983 Orixensis, Roxb.

4 other species, from

984 Colocasia, Willd.

987 to 990.

985 Fornicatum, Roxb.

Herbaceous plants, often with fleshy, edible tubers. The common *Koshoo* of the natives, who eat the young tender leaves as well as the roots.

Pistiaceæ.

Pistia, Linn.

991 Stratiotis, Linn.

A curious aquatic plant, found floating on still water.
Pora.

Gramineæ.

Of this Family, 61 species, from 995 to 1055.

This includes all the grasses, bamboos, and rice. As I have but few Botanical books by me, I cannot now undertake the grasses, sedges, and ferns, either to name them or to write any thing that would be satisfactory about them; even if I had books, I have not time. So far as the Company is concerned, it may be sufficient if I assure the directors, that there is plenty of the best kinds of grasses; bamboos in the greatest abundance, and rice of excellent quality, procurable to any amount, by making proper arrangements. It is certainly unnecessary for the Assam Company to go to the expense of growing rice, or of sending it into the province.

Cyperaceæ.

Of this Family, 3 species,
from 1056 to 1087.

Of the Genus *Cyperus* and of
Scirpus, 7 species, from
1088 to 1094.

These are all Sedges, or sedge-like plants, growing for the most part in wet ground or water, and not of much importance, save being very troublesome weeds in all cultivated ground, during the rains. One species, *Kyhor*i, produces an edible root, which is dug out of the ground in November, and eagerly eaten by the children.

ACROGENÆ.

Filices.

Of Ferns, 29 species, from 1095 to 1123.

Among these the gigantic Tree-fern, very fine specimens of which may be seen growing on the banks of the Desangabore Borehath, and on the banks of the Booree Dihing above Jeypore. The young, tender, unexpanded leaves of all Ferns, *Dekia*, are invariably eaten by the Assamese, as *Dekia Hak*.

Lycopodineæ.

Lycopodium, Linn.

1124 *Phlegmarium*, Roxb.

A curious parasitical? plant, found on the trunks of old trees.

Characeæ.

Chara, Linn.

1126 *Vorticillata*, Roxb.

1125 *Furcata*, Roxb.

Very curious aquatic plants, growing in stagnant water.

Miscellaneæ.

Of these, 94 unarranged Species, from 1127 to 1220.

Among them, 1131, *Nama zeylanica*, a curious plant with pretty blue flowers, found in rice-fields in the cold season; 1133, *Malachra capitata*, introduced from the Botanic Garden, and 1207, *Ailanthus* species, having a very strong smell of garlic.

The above may be considered as nothing more than a list of specimens of Assam plants *now* in my Herbarium; the whole of which, together with a more extensive collection from the vicinity of Calcutta, have this day been despatched to Major F. Jenkins, for Sir W. J. Hooker, Superintendent of H. M. Gardens, at Kew.

J. W. MASTERS.

Naxera, 19th June, 1843.

On the Fertilizing Properties of the Well-Water of Calcutta.
By J. W. LAIDLAY, Esq.

Whilst the attention of agriculturists in Europe has been directed, with the greatest advantage, to the chemical constitution of soils, there is an analogous branch of enquiry, which, in a special manner, demands the studious attention of the tropical cultivator; I refer to the quality of the water employed for irrigation. In India, the culture of entire districts depends upon an ample supply of this essential element; and though there may not always be room for selection, especially on the large scale, yet cases do occur, particularly in horticulture, where we have the opportunity of preferring a water suitable to our purposes, as well as rejecting one which may be deemed pernicious. And it is to this point that I would for a few moments solicit the attention of the Society.

The researches of modern chemists have rendered it all but certain that the fertility of soils depends essentially upon the quality and amount of their saline contents; and that the earthy constitution of a soil may vary very considerably, without materially influencing its capacity for sustaining vegetable life, provided its saline contents be such as are requisite for the perfect development of the plant. Nor is such saline matter to be considered, as but a few years since it was a mere accidental constituent of the vegetable organism; for not only have different plants their own several preferences for different inorganic salts, but the various parts of the same plant exhibit their peculiar preferences in a manner so marked and uniform, as to leave no room to doubt that they do so in obedience to a fixed law of their constitution. Thus, wormwood abounds in salts of potash; *salsola kali* in those of soda; the stalk of wheat and other cereals abound in silica, which is scarcely to be detected in

the grain; and the grain invariably contains a notable amount of phosphate of lime of which none, or but faint traces are discoverable in the mature stalk.*

It follows from these facts, that a soil capable of bringing plants to perfection must contain all the saline matter requisite for their constitution, precisely as the food of animals contains every earthy substance essential to the bony structure of the latter: a conclusion abundantly confirmed both by the analyses of soils remarkable for the production or the rejection of particular plants, as well as by direct experiments, like those of Wiegmann and Polstorf, on the vegetation of plants in soils destitute of the requisite salts; in which case they lived, at least for a time, but never attained maturity, rarely putting forth blossoms, and never seed.

In European climates, where the fall of rain is very much less than in the tropics, and diffused over the whole year instead of being restricted to a few months, the soil is much more likely to retain its soluble salts for a lengthened period than in this country, where the rain falls in deluges and thoroughly lixiviates the soil, especially where its texture is porous, and the substratum sandy. Hence the extreme rapidity, remarked by every observant agriculturist, with which the loamy deposits of the Ganges and other inundating streams lose their fertility if not overflowed for some years. Fields, which for a time bore luxuriant crops of indigo, and other plants greedily abstracting salts of potash or soda from the soil, becoming thus exhausted of this essential food by the drenching influence of the periodical rains, refuse to yield sustenance to useful crops, and are abandoned to wiry grasses abounding in silica, till a higher inundation restore for a time their wasted energies by a fresh supply of saline

* The phosphates in the ashes of the *grain* of wheat amount to 76.5 per cent. (Saussure); in the stalk to 2.3. (Berthier). The silica in the former to 1.9 (Thon), and in the latter to 71.5 (Berthier).

matter, as well as by causing the destruction, and promoting the decay of such organic matter as they may contain.*

It is an easy inference from these considerations, that the valuable saline contents of a soil must in time be transferred from the surface to the subsoil, whence they find their way into wells, and may be thence restored to the surface by irrigation. This, in fact, is what is constantly done in our gardens; but not in general, I am led to believe, from choice, or from the consideration that a Well may thus be made a permanent source of fertility, but because the water of tanks or of running streams may not be available for the purpose: for I am informed by our excellent Assistant-Secretary, Mr. Blechynden, that the prejudices of most people, and especially of native gardeners, are against the use of well-water, the soft and comparatively pure water of tanks being in general preferred, where it can be obtained. But this preference is not in consistence with the principles taught by the illustrious chemist of Giessen; and still less suitable is the water of tanks abounding in aquatic plants, which is of course thoroughly deprived of its salts by the latter; and however fitted for most manufacturing purposes by their agency, is in the same ratio rendered less valuable in horticulture.

Impressed with the importance of this subject, I have attended with great care to the progress of my own garden, which, since the rains, has been entirely irrigated with well-water containing a notable amount of inorganic salts; and I think I can observe a decided increase in the energy of vegetation as the restoration of the salts begin to tell upon the soil. The water of this well contains in 10,000 parts the following saline ingredients, all of which may be regarded as highly promotive of vegetable health.

* Some water taken from the river opposite Hooghly, in September last, being allowed to settle for some weeks, gave from 5000 grs. 1.06 of solid matter, of which 0.75 consisted of silica and carbonates of lime and magnesia; and 31 soluble matter, chiefly sulphates and chlorides.

238 *Fertilizing properties of the Well-water of Calcutta.*

Silica, ...	...	Grains	0.36
Carbonate of Lime, ...	...	...	3.25
Carbonate of Magnesia, ...	...	...	0.68
Sulphate of Lime, ...	...	...	3.65
Sulphate of Soda, ...	...	...	3.36
Sulphate of Magnesia, ...	...	...	1.04
Chloride of Sodium, ...	...	...	6.94
Chloride of Magnesium, ...	...	...	2.04
Chloride of Ammonium, ...	...	...	1.44
Nitrate of Magnesia, ..	..	..	1.77
Phosphate of Lime, ...	...	...	a trace.
Oxide of Iron, ...	...	...	a trace.
<hr/>			
			23.93

So that by the constant use of such water a very considerable amount of liquid manure is applied daily, in the most gradual and efficacious manner, to the soil.

It is probable, that the well-water of Calcutta and its neighbourhood may coincide qualitatively with the above: the amount of saline matter will differ a little from local circumstances, the season of the year, and the amount of water daily withdrawn. But in the alluvial soil of this neighbourhood there need be no apprehension of any thing pernicious to vegetation in their contents. In the native parts of the town the well-water will be found to be affected by the neighbourhood of manufactories, or godowns for salt or saltpetre. Thus, a well in the neighbourhood of the Burra Bazar, contained in 10,000 parts,

Nitrate of Potash, ... ..	..	16.57
Other Nitrates and Chlorides, ..	..	10.10
<hr/>		
		60.43

In conclusion, I would strongly recommend such as have hitherto employed tank-water for the irrigation of their gardens, to make a comparative trial of well-water. If the saline contents be similar to those stated above, it will certainly prove beneficial to the soil ; and if the soil be naturally of a good texture, art can perhaps do little more to promote its fertility, than offer a more abundant supply of phosphates and organic extract, if it be not already present. The former may be conveniently supplied by the wood ashes of the cook-house ; a valuable manure, generally dismissed in the Conservancy carts.

Note on the cultivation and preparation of Madder. By a Member of the Society.

In Holland, Madder is grown in a *very light sandy* soil, as free from stones as possible, and the roots are allowed to remain for three years, before they are removed.

The tops of the plants during the winter are covered over with a little earth, and in the early spring new shoots come up, which are again in the following winter covered with earth. In three years the roots attain to perfection, they are then carefully ploughed up, and having all the earth removed from them are placed on shelves over stoves to dry, which being finished, the outer bark and smaller roots are removed, ground up, and packed under the name of "Mull." The second process removes the next layer of root which, after it is ground, goes by the name of "Gamene." The third, or last process, is alone pounding up the pith which contains the finest coloring matter of all ; this is called "Crops." Occasionally, however, after the "Mull" has been separated, the remainder of the roots are ground up, and go by the name of "Ombro." All the operations of grinding and

240 *Note on the cultivation and preparation of Madder.*

packing are performed during the night, as light injures the color.

Berthollet in his *Elements of the Art of Dyeing*, mentions two or three different ways of preparing madder, the most simple of which is the following :—

“The roots are dried in the air on a paved floor, or on a hurdle. They are stirred about with a fork, and slightly beat, in order to separate the epidermis and the earth. What remains on the ground, composed of earth, epidermis, and small roots is sifted, and that left on the sieve forms what is called “Billon,” common madder, which is fit only for dull colors. The roots of madder thus picked are ground, either under a stone mill, or under knives similar to those of a bark mill. By means of Fanners or a Boulter, there is separated, after a first milling, the madder called “Non Robée.”

It is composed of a residuum of earth, epidermis and bark. After a second milling what is separated is called “Mi Robée.” Finally, after a third milling the “Madder Robée” is obtained, which is of the best quality. The “Mi Robée” is preferable however, when it comes from somewhat thick roots.

When milling is performed for one's own use, only one quality is made ; or if a very brilliant colour is wanted, the worst quality is separated by a first grinding, and the product of the second is employed. This is called “Grappier.”

*Further correspondence connected with the Government
Experimental Cotton cultivation at Dacca.*

(Communicated by the Government of Bengal.)

To J. DUNBAR, Esq., Commissioner of Dacca.

SIR,--I have the honor to submit to you, for the information of His Excellency the Governor General of India, the monthly report of my proceedings for the month of May.

In the early part of this month, after forwarding a part of the choppers required at the Government Farm, and engaging grammees to proceed to Toke to erect the huts, I went to Narraingunge, and took with me the seven packages of Cotton seed which I received from you, and after sending two small bags of it to J. P. Wise, Esq. to be forwarded to Phoolbarriah and Manickgunge, and also taking what was required for the present sowing, I put the remainder in *culsis*, after having it properly dried in the sun, and then secured it from the air, and hung it up in smoke as the natives do ; this I hope will keep it sound until it is required. The American kind appears to be very good, but I am sorry to say that about half of the Bourbon kind is quite rotten ; however a part of it I think is still good. From thence I proceeded to Toke, and commenced, on the 16th, putting up the huts, and I have now nearly twenty-five of them finished, which is all I intend putting up here at present for coolies. I have reserved the remaining twenty-five of the fifty that I engaged, for the Farm to be settled in the southern part of the district.

I did not succeed in getting any coolies until the 20th ; on which day four came and offered their services, but since that time they have increased in number daily, and now have in all twenty-one. I have had them engaged in clearing off jungle and preparing land for seed, some of which I will be able to plant in a day or two.

I have had a great deal of trouble in getting ryots to plough for me, being all very busy with their own paddy crop ; but on the 25th I succeeded in getting seven, and have had from eight to ten every day since, so that I now hope to get on well, as my difficulties are by degrees disappearing.

I am much in want of a horse, as the American system of cultivation being new to the natives of this country, I am obliged to be constantly moving about the plantation. I would also beg leave to recommend, should it meet with your approval, that the Farm should be supplied with twenty head of bullocks, so as to have ploughs of our own when required, instead of waiting until the ryots have finished their own lands before we can cultivate ; besides their stock are so small, that they only scratch the land instead of ploughing it. If allowed, I think I could purchase in Cappasia, stock that would answer our purpose at present.

With this Report you will please receive the monthly accounts for the Ryotee and Neej cultivation.

I have, &c.

(Signed) J. O. PRICE,

Dacca, 31st May, 1845.

Govt. Cotton Planter, Dacca.

SIR,—I have the honor to submit to you, for the information of His Excellency the Governor General of India, the monthly report of my proceedings for the month of June.

2nd. On the 1st of this month, I planted about two beegahs of land on the Government Cotton Farm, with acclimated American seed, which vegetated very quickly, and is now about eight inches high, and looking very healthy ; I also planted some on the 4th, 10th and 17th instant, all of which looks well, but I regret to say the constant rains we have at present, will neither admit of weeding or moulding as it should be done ; however it has not yet suffered any thing of any consequence, and I hope we will soon have a few dry days to clean and mould it, as well as to prepare land for

further planting. I have only been able to plant about six beegahs this month, which was all I could get ready, not having been able to obtain coolies to prepare land sooner, besides the weather has been very unfavourable for planting; but should it admit of my doing so, I hope to be able to plant from thirty to forty beegahs in all July; some of the seed that I have distributed in different quarters of this district, I am happy to say, I have been informed, looks very promising.

3rd. The coolies have been engaged principally in *codal-ling* land for the July sowings, draining, making fences, clearing of jungle, &c. &c., and the grammées in erecting the huts necessary for the Farm.

4th. In the copy of a Government letter I had the honor of receiving from you in December last, accompanied with one from yourself, No. 451, it was stated that the Government of the North-West Provinces had been requested to transfer to Bengal, for my use, all the farming implements purchased for the use of the American Cotton planters, but now no longer required in that quarter, and Mr. Terry, the period of whose engagement expired in April last, would be directed to make over the implements in his possession belonging to Government. None of either having yet arrived, I take the liberty of mentioning the subject to you, as I have been informed that Mr. Terry, had two (hand) Saw-Gins in the implements he had, which I was in hopes would have been forwarded to this District, and particularly so as they would have been easily moved about from place to place; besides if left neglected for any length of time in this damp season, they will be of little or no use afterwards.

5th. I have received, through the kindness of G. D. Glass, Esq., three packages of Cotton grown at Betal, from seed that I gave him in December 1843; one part of it has been cleaned by the Native Churka, another by hand-picking, and the third remains unseparated from the seed; I would have

liked very much to have had one of the Hand-Saw Gins, to have cleaned it with, so as to have been able to have compared the three staples together. I purpose sending a package of each to the Agricultural Society; the plants from which it was taken have been bearing for the last ten months, and still continue to do so.

I have, &c.

(Signed) J. O. PRICE,

Toke, Govt. Farm, June 30th, 1845. Govt. Cotton Planter.

To the Sudder Board of Revenue, Fort William.

GENTLEMEN,—In transmitting Mr. Price's Report for the month of July 1845, I have the honor to state, that about a fortnight since, on my way back from Mymensing, whither I had proceeded on circuit duty, I visited the Cotton plantation near Toke.

2nd. The rains have been so incessant in this quarter during the last two or three months, that Mr. Price has been able to plant but a very small portion of his lands; and from what I saw of the plant, I very much fear that a continuation of the extremely wet weather we have had, would inevitably destroy it. We have had more sunshine during the past week, and I would fain hope that the plant will come round again before long. Mr. Price has still a good supply of seed in hand, which will be committed to the ground when the weather has become settled enough to give hope of better success.

3rd. I shall take measures for procuring some Bullocks of the kind required by Mr. Price.

I have, &c.

*Commr's. Office, Dacca Divn.
Dacca, the 8th August, 1845.*

(Signed) J. DUNBAR,
Commissioner of Revenue.

SIR,—I have the honor to submit to you, for the information of His Excellency the Governor General of India, the monthly report of my proceedings for the month of July.

2nd. From the unusual quantity of rain that has fallen in this district, during this month and the latter end of the last, I have been prevented from being able to prepare any land for planting, (with the exception of about two biggahs, only a part of which I have been able to plant on account of the wetness of the land) ; I have been therefore obliged to confine my proceedings this month (with the few coolies, I have employed) in a great measure to ditching, which was very much required.

3rd. The cotton seed that I planted last month, and which I mentioned in my last report as being very promising, I regret to say, has suffered very much from the long continuation of the rains ; indeed so much so, that a part of it will require to be planted over again as soon as the weather will permit of my doing so. The seed that I planted in the early part of last month still looks healthy, and I am in hopes will do well yet, although it has not grown an inch in all this month.

4th. I find on particular enquiry, that I will not be able to procure any bullocks in this neighbourhood, that would be of any service on the farm ; those that the ryots would part with are either too old or have been surfeited from being overworked, and therefore would be equally useless to us as working stock. I have been informed by Indigo Planters, who are accustomed to buying stock, and well acquainted with this district, that if we want good stock at present we must get them from Patna. The cattle from that district being larger and stronger than those in this district, would be better adapted for the American plough, which I still hope to be able to introduce in this district. If we had about twelve head of those Patna stock for heavy work, I think they would be sufficient, as we should also have a few of the smaller kind to work the Bengal plough with ; these

we will be able to procure in Mymensing district in the month of November, which I am informed is the usual time of purchasing young stock for factories.

I have, &c.

(Signed) J. O. PRICE,

Toke, Govt. Farm, July 31st 1845. Govt. Cotton Planter.

To the Sudder Board of Revenue, Fort William.

GENTLEMEN,—Herewith I have the honor to transmit Mr. Price's report for August 1845, which only came into my hands yesterday, in consequence of my absence at Backergunge, during the earlier part of this month.

2nd. As regards the cotton now in the ground at Toke and elsewhere, the report is very satisfactory. I am quite of Mr. Price's opinion, that for the present it will be better to confine the *neej* cultivation to the plantation at Toke. When the establishment there has been fully provided for in every way, it will be time enough to mark out another experimental farm, in the lower parts of the district; should it not be found in the interim that a *ryottee* cultivation is likely to be more successful. I have written fully upon this subject to Mr. Price.

I have, &c.

Commr's. Office, Dacca Divn. (Signed) J. DUNBAR,
Dacca, the 27th September 1845. Commissioner of Revenue.

SIR,—I have the honor to submit to you, for the information of His Excellency the Governor-General of India, the monthly report of my proceedings for the month of August.

2nd. The weather during last month having been much more favourable for planting than that of July was, I have been enabled to plant about twelve biggahs of land with American seed, which has all vegetated, and looks very healthy.

3rd. I have much pleasure in being enabled to inform you, that a great part of the land, planted in June, which you saw when you called at the farm, and which suffered so severely from the unusually heavy rains we had had, has now quite recovered, and is very healthy in appearance.

4th. In the latter part of this month I visited Phool-barreah, for the purpose of examining the small patch of cotton I planted at that place. It is now about seven feet high, and covered with forms and small bowls, and promising to bear as abundantly during the ensuing dry season as it did during the last one. From thence I proceeded to Lucypore, at which place there is about a biggah of land, which was planted with exotic seed in May. I have not seen any cotton in this country of the same age more promising than this is, it is now from two to three feet high. On my return to Dacca, I also examined another place, at which there is some foreign cotton seed planted; which also appeared healthy.

5th. On my leaving Dacca, I proceeded to Naraingunge to examine the machinery, implements, &c. that had been received from Rungpore, and I regret to say that I found the two hand gins in very bad order; but after I have them properly cleaned and repaired, I will be better able to judge of the likelihood of their being of any service.

6th. Taking into consideration the difficulties we have had to contend with in establishing the farm, occasioned in the first place by the disappointment of not getting coolies from Government, and in addition to that the unusual quantity of rain that has fallen since May, I beg leave to state to you that I think it would be better to confine the experimental *neej* cultivation to this farm alone, at least for this year, so as to get it properly established before commencing on the one to the southward: and instead of the additional farm, I have the honor of agreeing with you in opinion that it would be advisable, as we are now sure of having good seed,

248 *Experimental Cotton cultivation in the district of Dacca.*

to establish a *ryottee* cultivation on a limited scale. J. Wheler, Esq. Collector, has kindly offered to get ten big-gahs planted in Hattia or Sundeeep, and the same quantity at Chittagong.

I have, &c.

(Signed) J. O. PRICE,

Toke, Govt. Farm, Sept. 10th 1845. Govt. Cotton Planter.

SIR,—I have the honor to submit to you, for the information of His Excellency the Governor General of India, the monthly report of my proceedings for the month of September.

2nd. The weather in the early part of this month having continued favourable for planting cotton, the coolies on the farm were engaged in planting American seed up to the 7th ; from which time the weather was so unfavourable for cultivation, that very little could be done in any way until the 21st. when it changed and became more favourable. The young plant has suffered very much from the long continuation of rain, accompanied with high winds. During the remainder of the month the coolies have been employed in moulding up the young plant, having been nearly washed out of root by the late rains ; still I am in hopes it will do well, and that I may be enabled to report more favourably of it next month.

3rd. The seed planted in June having got sufficient strength to contend with the weather, has suffered very little, and is looking well.

I have, &c.

(Signed) J. O. PRICE,

Dacca, 17th October, 1845.

Govt. Cotton Planter.

Monthly Proceedings of the Society.

(Wednesday, the 8th January, 1845.)

The Hon'ble Sir J. P. Grant, President, in the chair.

The minutes of the last general meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last meeting were duly elected Members of the Society, viz.

Lieut. E. H. Impey, Baboo Hollodhur Bhoose, Messrs. Charles Sutherland and G. B. Robinson.

Candidates for Election.

Wm. Cragg, Esq., Junr., merchant, Calcutta, proposed by Mr. W. Storm, seconded by Mr. H. W. Lake.

Robt. B. Lake, Esq., merchant, Calcutta, proposed by Mr. H. W. Lake, seconded by Mr. W. Hammill.

Capt. Wm. Swatman, (Assistant Commissary-General), proposed by Mr. A. Sconce, seconded by Mr. F. Stainforth.

Major H. Delafosse, C. B., Artillery, proposed by Capt. F. C. Burnett, seconded by Mr. C. K. Robison.

Lieut. S. C. Woodcock, Artillery, proposed by Capt. Burnett, seconded by Mr. Robison.

Lieut. S. W. Stokes, Artillery, proposed by Capt. Burnett, seconded by Mr. Robison.

Lieut. H. Leg. Bruce, Artillery, proposed by Capt. Burnett, seconded by Mr. Robison.

Alexander Fraser, Esq., Civil Service, proposed by Mr. John Allan, seconded by Mr. W. Storm.

Election of Office-Bea

The President intimated that this being it was necessary that the election of Office-Beas should take place. He would beg to state that vacancies had occurred in the list of Vice-Presidents, in consequence of the demise of Baboo Ram Comul Sen, and the resignation of Dr. Griffith and Baboo Dwarkanath Tagore, the former having left for Malacca, and the latter being about to leave very shortly for Europe.

The Members then proceeded to the election appointing Dr. Hufnagle and Mr. W. Storm the scrutineers, who reported the result to be as follows :—

Sir John Peter Grant, <i>President.</i>	
Sir Lawrence Peel,	} <i>Vice Presidents.</i>
C. K. Robison, Esq,	
Rajah Radakant Deb,	
Baboo Ramgopaul Ghose,	
James Hume, Esq., <i>Honry. Secretary.</i>	
A. H. Blechynden, Esq. <i>Depy. Secty. and Collector.</i>	

Proposed by Mr. Wale Byrne, seconded by Mr. W. Storm, and unanimously agreed to,—

“ That the thanks of the Society are eminently due to James Hume, Esq. as well for the zeal and ability with which the duties of Secretary to the Agricultural and Horticultural Society have been attended to, as for his disinterestedness in the gratuitous discharge of the duties of that office for the last two years.”

Letters were read from Dr. Griffith and Baboo Dwarkanath Tagore, tendering their resignation of office as Vice-Presidents. Dr. Griffith observes, “ my connection with the Society has given me a strong interest in all that the Society does or wishes to do, I trust therefore, that I may hope to be useful to it while at Malacca, or wherever I may be.”

Proposed by the Secretary, seconded by Mr. Robison, and unanimously *resolved*,—

“ That in consideration of the readiness evinced on every occasion by Mr. W. Griffith to assist the Society with his advice, as a Member, and in every other way within his province, as Officiating Superintendent of the H. C. Botanic Garden, the best thanks of the Society be given to that gentleman.”

It was resolved to defer the revision of the Standing Committees till the next general meeting.

Annual Reports.

The Annual Report of work done by the Society during the past year was then submitted, and referred to the Committee of Papers. A Report from the Finance Committee for the year 1844, was also read, and the several statements connected therewith laid on the table.

East India Sugar Question.

The Secretary intimated that the Special Committee appointed by the Society to take into consideration the question of the duties on sugar, having previously recorded their sentiments, had a meeting on the 14th ultimo. He now begged to read the resolutions

which were passed at that meeting, and to submit the draft of a petition, founded thereon, to the two Houses of Parliament :—

“ 1st. That it is the opinion of this Committee that a petition be presented by the Society on the subject of East India sugars.”

“ 2nd. That the object of the petition be, for a general reduction of duties upon colonial and free labour foreign sugars, retaining a proportionate difference, similar to the present, and for soliciting the removal of any restrictions upon refined sugars ; also, for the continued exclusion of slave-grown sugars, and for an assurance that no change may immediately take place to the prejudice of colonial interests.”

After some discussion in regard to the wording of certain paragraphs of the petition, it was proposed by the Secretary, seconded by Mr. Haworth, and resolved,—

“ That a *special* meeting of the Society be held on Tuesday afternoon next, the 14th instant, at 4 o'clock, to receive and take the petition into consideration.”

The Hon'ble the President gave notice that he would move, at the special meeting, that the following words in the resolutions be omitted, viz :—

“ And free labour foreign sugars, retaining a proportionate difference, similar to the present”—and—“ also, for the continued exclusion of slave-grown sugars.”

Mr. Haworth gave notice that, at the same meeting, he would move that the words, “ from British possessions” be inserted in the sixth paragraph of the petition, after the words “ of any quality.”

The following is the draft of the petition :—

TO THE HON'BLE THE COMMONS OF GREAT BRITAIN AND IRELAND
IN PARLIAMENT ASSEMBLED :

*The Petition of the Agricultural Society of India, which comprises
600 members.*

Humbly Sheweth,

1st. That the cultivation of sugar throughout British India is considered so desirable, both for the Agriculturist and the Landowner, and the Mercantile interest, that it has already advanced in the face of very great obstacles, so as to form one of the great staples of agriculture and commerce ; its cultivation could be carried out to an immense extent, if due protection is given to the planter, and which would result in a proportionate increase in the consumption of English manufactures in return.

2d Being fully alive to the important interests at stake, your petitioners crave that there may be a general reduction of the present duties upon colonial and free labour foreign sugars—retaining the present, or an equivalent differential duty.

3d. Your petitioners would earnestly urge the continued exclusion of slave-grown sugars.

4th. Your petitioners humbly pray for an assurance that no change will again be made in the duties, to the prejudice of colonial interests, within a stated period of some years.

5th. Your petitioners believe, that by a general reduction of duties on colonial and free-grown foreign sugars, keeping a moderate protecting difference in favour of the produce of British possessions, an increased consumption would immediately follow a reduction in the present rates of duty : both the colonial interest and the consumer would be satisfied, and most probably the revenue, from this source, would not be diminished, but, on the contrary, in the course of a short period, an increase of revenue might naturally be expected. The consumption of British manufactures would materially advance in this country, as it did during the last ten years, when the export of sugar from Calcutta was raised from 3,500 tons to 55,000 tons a year ; and during the same time the increase in the import of cotton twist was about 7 million pounds weight, and $3\frac{1}{2}$ millions of piece-goods, most of which, it is believed, was paid for in sugar ; thus shewing that the production of sugar in India is worthy of every encouragement.

6th. Your petitioners also pray that the present prohibitory duty upon refined sugar may be taken off, as an act of justice to the colonial interest ; and that refined sugar of any quality, whether crushed or in loaves, may be admitted on the same terms as other sugar. This having been allowed to a certain extent of late under a liberal interpretation of the law, still shipments of such are made under great uncertainty. The measure would be of great importance to all engaged in the manufacture of sugar, whether European or Native, the extra cost of obtaining a highly refined article, being very trifling beyond that required to bring the quality to the point now understood to be admissible. This boon would now enable the native growers to find a good market for all their *goor* and *khaur* sugars, the shipments of the latter being almost put a stop to, from the excessive drainage and deterioration on the voyage. The granting of this boon, it is believed, would not, in its effects, interfere with the financial arrangements of the state.

7th. Your petitioners beg earnestly to call the attention of your Hon'ble House to the fact of great efforts being now in progress, and that large investments of capital have already been made, with the view of improving the culture of the cane and the manufacture of its juice, by employing the best European machinery and skill ; the result of which cannot yet be ascertained, although the present operations promise well. To enable parties to proceed with confidence in their endeavours to increase the production of sugar in this country, it is very desirable that the duties be fixed for a term of years.

8th. For the reasons set forth, your petitioners most respectfully submit to the favorable consideration of your Hon'ble House that the measures prayed are just and expedient.

And your petitioners will ever pray.

Notice of Motions.

The Secretary read a communication from Mr. L. Wray, alluding to the circumstance of his having completed his treatise entitled the "Sugar Planter's Companion," which has been published in the Society's Journal, and submitting whether the work be not deserving of some consideration at the hands of the Society; whereupon, the following notice of motion, for next meeting, was given by Mr. Storm, seconded by Mr. Speede :—

"That on the grounds set forth in Mr. Wray's letter, the Society's gold medal, and 500 rupee, be awarded to Mr. Wray for his work, 'the Sugar-Planter's Companion,' which has been contributed to the Society's Journal."

Mr. C. K. Robison also gave the following notice of motion for next meeting :—

"That the present hour (half-past nine A. M.) for the monthly meetings of the Society, being inconvenient for the attendance of the native members, it be changed in future, from that hour, to 4 o'clock in the afternoon."

(Tuesday, the 14th of January 1845.)

SPECIAL MEETING.

Baboo Ramgopaul Ghose, Vice-President, in the Chair.

Present.

Messrs. W. F. Fergusson, Wm. Haworth, H. W. Lake, W. C. Braddon, J. W. Roberts, J. W. Carter, Baboo Huraynarain Day, and James Hume, Honorary Secretary.

The Secretary read a letter to his address from the President, intimating his regret that indisposition prevented his attendance at the meeting, and stating his reasons for proposing at the general meeting the omission of certain clauses in the petition. These were, firstly,—that exclusion of slave-grown sugar by prohibitory duty was hopeless, that it was beyond the power of the legislature, or even to prevent the encouragement given to its growth by the consumption of Great Britain, since the space left in foreign countries by the free-grown sugar consumed there would be instantly filled by slave-grown sugar for the supply of those countries. Secondly,—That the direct encouragement thus given to the importation of slave-grown sugar into countries abroad, in lieu of, or in competition with free-grown foreign sugar, will keep down the price of the latter, and enable it more effectually to contend with British Colonial sugar in the Home market. Thirdly,—That whether these views were correct or not, they were too important and required too much political knowledge as well as theoretical consideration, to make it advisable for the Society to pledge itself to an opinion; and

lastly, that, expressing its earnest wish to discourage the employment of slave labour and its gratitude to Providence that no such outrage against human happiness and virtue as result from predial slavery, existed in the British dominions in India, the Society should confine itself to the manifest advantages that would result to those dominions, to the mother country, and to the improvement of the wealth, comfort and happiness of the agricultural labourers of India, from securing Indian sugar on the same footing of protection with that produced by other colonies of the empire, leaving it to Parliament to deal with the question of foreign slave-grown sugar as in its wisdom it should deem expedient.

The Secretary next read a minute by Mr. Willis a member of the Special Committee (written after the preparation of the draft petition), strongly dissenting from the proposed petition, on the ground that there is no protection in seeking to uphold a measure of monopoly, that such protection is not shewn to be wanted and that it is altogether repugnant to free trade. Mr. Willis thinks that it would rather be "better to petition for as early an equalization of sugar duties from all countries as is possible, and as is compatible with some respect to the many interests which have unfortunately arisen in all our colonies during the age and system of monopoly protection."

The following are the resolutions objected to, and the words in italics were the proposed omissions :—

"That the object of the petition be for a general reduction of duties upon colonial *and free labour foreign sugars, retaining a proportionate difference, similar to the present*, and for soliciting the removal of any restrictions upon refined sugars; *also, for the continued exclusion of slave-grown sugars*, and for an assurance that no change may immediately take place to the prejudice of colonial interests."

After some discussion, in which all the members, with the exception of the Secretary, expressed themselves favorable towards the principles involved in the petition, Mr. Haworth proposed, and Mr. Braddon seconded the following resolution :—

"That the sugar petition as it now stands be approved and sent forward, and that the words, "from British possessions," be added to the sixth clause after the words "of any quality."

With the view, if possible, of avoiding the expression of any difference of opinion in the Society, on an occasion when unanimity was so desirable, Mr. Fergusson suggested the following as an amendment to the second clause objected to :—

"Your petitioners crave that there may be a general reduction of the present duties upon colonial and free labour foreign sugars, retaining an equivalent differential duty similar to the present *between colonial and foreign sugar*," and the omission of the third clause altogether :—

"Your petitioners would earnestly urge the continued exclusion of slave-grown sugar."

This amendment being put, met with no support. The original resolution was then put and carried.

It was then proposed by Mr. Fergusson, seconded by Mr. Lake, and carried, "That the petition be sent to the E. I. and China Association, and that they be requested to entrust it to such parties as they consider to take the greatest interest in the matter."

(Thursday, the 13th of Feb. 1845.)

C. K. ROBISON, Esq., Vice.-President in the Chair.

The proceedings of the last general meeting, and of the special meeting on the 14th January, were read and confirmed.

Members Elected.

The gentlemen proposed at the last general meeting were duly elected members of Society; viz.,

Messrs. Wm. Cragg, R. B. Lake, and Alexander Fraser, Capt. W. Swatman. Major Delafosse, Lieut. S. C. Woodcock, Lieut. S. W. Stokes, and Lieut H. Leg. Bruce.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election:—

John Panton Gubbins, Esq. Civil Service, proposed by Mr. John Allan, seconded by Mr. Wm. Storm.

W. A. Rolfe, Esq., Medical Service, proposed by Mr. Robert Watt, seconded by the Secretary.

G. L. Young, Esq., Ballacole Factory, Pubna, proposed by Mr. Wm. Storm, seconded by the Secretary.

Brian Hodgson, Esq., Civil Service, proposed by Dr. Huffnagle, seconded by Mr. Balfour.

C. C. Bruce, Esq., proposed by Mr. Wale Byrne, seconded by Dr. Huffnagle.

Baboo Debendernauth Tagore, proposed by Baboo Ramgopaul Ghose, seconded by Dr. Mouat.

Baboo Nursingchunder Bose, proposed by Baboo Ramgopaul Ghose, seconded by Dr. Mouat.

Baboo Nobinchunder Bose, proposed by Baboo R. G. Ghose, seconded by Dr. Huffnagle.

Baboo Hemnaut Roy, proposed by Baboo R. G. Ghose, seconded by Mr. W. Haworth.

Presentations to the Library.

1. Journal of the Asiatic Society of Bengal, Nos. 66. and 67.—
Presented by the Society.

2. Calcutta Journal of Natural History, No. 20.—*Presented by Dr. McClelland.*

3. The India Journal of Medical and Physical Science, No. 12 of vol. 2, and No. 1 of vol. 3.—*Presented by Dr. Finch.*

GARDEN AND MUSEUM.

1. A large supply of the white sweet potatoe (*Sukerkund aloo*) from Sumbulpore.—*Presented by Lieut. Col. J. R. Ouseley.*

2. A large supply of yams from Rangoon, called by the Burmese, *Thadway-oo*.—*Presented by Capt. Wm. Spiers.*

Capt. Spiers sends this supply under the impression that this yam is unknown in Bengal, as he has no recollection of having seen it here. It is however, known, though not in common, in the Calcutta bazars, as the Tenasserim yam; it is very superior in flavor to the generality of yams.

3. A further quantity of the tubers and dried specimens of the *Tacca pinnatifida* from Chedooba Island.—*Presented by Major D. Williams.*

The Secretary mentioned he was indebted to Dr. Wallich for the name of this plant, of which a few tubers, and a farinaceous powder prepared therefrom by the Mugs were presented by Major Williams at the meeting in December last. Mr. Speede reports that in external appearance, this powder is similar to that of the true arrow-root; that it is clear and well-manufactured, but far inferior in strength to the arrow-root, requiring at least twice the quantity that is necessary of the latter to make the same strength of jelly. He is, therefore, of opinion that the article would be unprofitable for this market, unless it can be produced at a much lower rate than arrow-root.

4. A few seeds of the *Theobroma cacao* and a specimen of tea-seed oil extracted by heat.—*Presented by Capt. A. Charlton.*

Captain Charlton mentions that this oil is used in China for culinary purposes, and as lamp oil, and is said to be efficacious as an embrocation for gouty and rheumatic complaints, and he adds, 'the best oil is extracted by what is usually termed the cold-drawn process. The seeds are separated from the capsules, and put into the sun, till the outer brown cuticle which envelopes the kernel admits of being easily detached. They are then crushed and the oil expressed. A picul of fresh seed is said to yield about 25 cattles of oil. Many maunds of seed, I recollect, decayed upon the ground annually in Assam. I should think it would be advantageous to use them for extracting oil.'

5. A few specimens of Chinese manures and seeds; the latter consisting of a species of millet, two kinds of beans, oil, and varnish nuts, and seeds of the medick or trefoil.—*Presented by Dr. Alexander Grant.*

6. A small box of seeds from Barbadoes, containing among other kinds, a few seeds of the scarlet cordia, soursop, scarlet bean

tree, *duranta ellisii*, and of the logwood tree.—*Presented by B. J. Colvin, Esq.*

7. Half a mound of *gurjun-tale*, or wood-oil, from Arracan.—*Presented by Lieut. W. F. Nuthall.*

Lieutenant Nuthall mentions that this oil is procured from a tree called by the Mugs *Kow-gyan*; a specimen of it is included in the large assortment of woods which he lately forwarded to the Society. Many thousand maunds of the oil, Lieut. Nuthall adds, could be procured upon a demand, and at about three rupees per maund.

8. A large quantity of acclimated American maize of the "yellow gourd," flint corn" and "sugar" varieties, and about a hundred lavender seedlings—*From the Society's Nursery Garden for distribution.*—Though grown out of season, this maize is almost equal to the original stock in length and thickness.

Revision of Standing Committees.

The revision of the Standing Committees was the subject that first engaged the attention of the meeting. The Secretary mentioned that the departure of Mr. Griffith had occasioned a vacancy in the Garden Committee and Committee of Papers, which it would be necessary to fill up; both these Committees, as also a few others, required strengthening, and he therefore begged to submit the names of the following gentlemen for that purpose:—

For the Sugar Committee, in addition,—Messrs W. Haworth and S. H. Robinson.

For the Committee on Coffee and Tobacco, in addition,—Messrs. W. Storm and C. K. Robison.

For the Committee of Implements of Husbandry and Machinery, in addition,—Mr. H. Mornay.

For the Nursery Garden Committee, in the room of Mr. Griffith,—Mr. W. G. Rose.

For the Fruit and Kitchen Garden Committee, in addition,—Mr. Rose.

For the Committee of Papers, in the room of Mr. Griffith, and the late Mr. Bignell,—Dr. Hufnagle, Mr. C. R. Prinsep, and Mr. J. W. Laidlay.

The General Committee was removed from the list as no longer necessary under the present arrangement. It was proposed by Dr. Hufnagle, seconded by Dr. Mouat, and resolved, that the following committees, as revised, be the Standing Committees for the current year:—

Sugar.—Messrs G. U. Adam, John Allan, H. Piddington, James Cowell, Wm. Haworth, and S. H. Robinson.

Cotton.—Messrs Joseph Willis, Charles Hufnagle, W. Earle, G. U. Adam, and Robert Saffith.

Silk, Hemp, and Flax.—Messrs R. Watson, J. Willis, C. K. Robison, and G. T. F. Speede.

Coffee and Tobacco.—Dr. Strong, Messrs H. Piddington, W. Storm, and C. K. Robison.

Implements of Husbandry and Machinery.—Col. Forbes, Messrs C. K. Robison, Charles Huffnagle, H. Mornay, and Rajah Radhakant Deb Bahadoor.

Oil and Oil Seeds.—Dr. Mouat, Messrs Wm. Haworth, H. Mornay, James Cowell, John Allan, H. C. Kemp, and Baboo Ramgopaul Ghose.

Grain Committee.—Messrs Joseph Willis, Wm. Storm, Charles Huffnagle, John Jenkins, Wm. Haworth, C. R. Prinsep, G. T. F. Speede, and Baboo Ramgopaul Ghose.

Improvement of Cattle.—Messrs Charles Huffnagle, C. R. Prinsep, W. P. Grant, C. K. Robison, and Wm. Storm.

Nursery Garden Committee.—Messrs Wm. Storm, R. Dodd, H. W. Lake, T. H. Lakin, and W. G. Rose.

Fruit and Kitchen Garden Committee.—Messrs Wm. Storm, H. Piddington, G. T. F. Speede, R. Dodd, and W. G. Rose.

Committee of Papers.—Dr. Mouat, Messrs Charles Huffnagle, J. W. Laidlay, and C. R. Prinsep.

Finance Committee.—Messrs Charles Huffnagle, and M. S. Staunton.

DISPOSAL OF MOTIONS.

The "Sugar Planter's Companion."

The motion, of which notice was given at the last meeting by Mr. W. Storm, "that, on the grounds set forth in Mr. Wray's letter, the Society's gold medal, and 500 rupees, be awarded to Mr. Wray, for his work, "the Sugar Planter's Companion," which has been contributed to the Society's Journal," was brought forward. After a little discussion, it was agreed to refer the question for report to the Sugar Committee, and Committee of Papers, conjointly.

Temporary Change in the Hour of General Meetings.

The other motion, of which notice was also given at the last meeting by Mr. Robison, "That the present hour (half past nine a. m.) for the monthly meeting of the Society, being inconvenient for the attendance of the Native Members, it be changed, in future, from that hour, to 4 o'clock in the afternoon"—was next brought forward.

Baboo Ramgopaul Ghose submitted a circular, which he had addressed to the native resident members on the above subject. It had been signed by about a dozen members, who concur in opinion, that the proposed change of hour would be much more convenient to

them, and admit of their attending the meetings of the Society. After some little discussion, it was proposed by Mr. Robison, seconded by Dr. Huffsagle, and agreed, that the Society meet at 4½ p. m. and 9½ a. m. alternately, till further notice, the first meeting to be at 4½ o'clock.

Horticultural Exhibition.

A list of native gardeners, to whom money prizes to the extent of 80 rupees, and four medals, were awarded at the show of vegetables and fruits, held on the 15th January, was next submitted. In the remarks appended to the list, it is mentioned that upwards of 200 *malees* attended the show. As respects European vegetables, this was considered an excellent exhibition. The display of brocoli, American squash, endive, Scotch kale, and Windsor beans—vegetables seldom seen at former exhibitions, or in very small quantities—was very good. There were also several fine specimens of American flat turnip, early York and red cabbage, coss lettuce, carrots of sorts, spinage, beet, and potatoes. The cauliflowers were indifferent, the heads wanting compactness; and of peas, there were only two or three good baskets. The celery was of good colour, but not firm.

The assortment of indigenous vegetables was limited; but there were some good specimens of Assam bean, Tenasserim yam, cucumber, and maize.

Under the head of fruits, several specimens of pomegranates, sapotas, guavas, and papeeahs, were exhibited. Prizes were given for baskets of green mangoes, custard apples, pine apples, and rose apples, as they were produced out of season; also, for oranges grown in the neighbourhood of Calcutta, and for a single soursop.

Nursery Garden.

A report from the Garden Committee was read. The Committee announce the completion of the additional work which has been in progress during the last six months—viz, the thorough trenching of about 15 beegahs of ground, the formation of a main and branch walks, &c. They allude to the planting out of 8 beegahs of land with Otaheite cane, to meet a probable large demand next season, the supply this season having been very insufficient. They refer to the circumstance of Dr. Wallich having agreed to recommend to the Government the proposed extension of the present allotment, and to the steps which have been taken to procure supplies of fruit trees from various quarters. The committee close their report with a few suggestions regarding the better protection of the boundary, &c.

At the close of the perusal of the above report Captain Munro observed that he had lately visited the Nursery, and thought it

would be better to bring the allotment, now under charge of the Society, into a higher state of cultivation, before applying for an additional piece of ground : whereupon, the Secretary remarked that the recommendation originated with Mr. Griffith, the late Officiating Superintendent of the Botanic Garden, and was fully approved of by the other members of the Committee. The possession of a larger piece of ground would admit of portions of the present allotment lying fallow, and this was one of the principal objects the Committee had in view in preferring the suggestion.

Resolved,—That the report of the Committee be confirmed, with the exception of the proposal of leasing out the tanks.

Sugar-duty Petition.

The Secretary informed the Members that, in accordance with the resolution of the *special* meeting, he had forwarded the petition on the Sugar Duty question, to the Secretary of the East India and China Association, by the January mail, accompanied by the following letter :—

To J. STIKEMAN, Esq., Secretary E. I. and China Association.

SIR,—I have the honor to annex, for the information of the East India and China Association copy of a resolution which was passed at a special meeting of the Agricultural Society of India, held on the 14th instant, to take into consideration the draft of a petition to Parliament on the sugar duty question.

In conformity with that resolution, I beg to advise you of the despatch, by the present mail, of two copies of the petition for both Houses of Parliament, and doubt not the East India and China Association will undertake to “entrust them to such parties as they consider to take the greatest interest in the matter.” At the same time, I think it proper to mention, that a difference of opinion exists among the members of the Society in regard to this petition. The limited time allowed for its circulation has not admitted of its being sent to all the *resident* Members, amounting to 180; it has been seen by about 103 persons, of whom 78, you will observe, have signed it. Among the number of dissentients, I may observe, are the President, Vice-Presidents, and Honorary Secretary of the Society.

I have, &c.,

(Signed) JAMES HUME,
Honorary Secretary.

January 22nd 1845.

Vernacular Hand-book of Agriculture, Horticulture, and Farming.

The Secretary brought to the notice of the Meeting a manuscript work, in the Ordoos language, and Persian character, on Agriculture,

Horticulture, and Farming, which had been submitted at the meeting in September last, to compete for the prize offered by Mr. H. C. Tucker, and which was then referred for report to the Committee of papers. The Committee had accepted the obliging offer of one of its Members to examine the work, and procure the opinion of some of the head Moulavees of the Madressa, as to the purity, correctness, elegance, and simplicity of the language employed; and he had now the pleasure to read the following letter from Dr. Mouat, in reference to that offer:—

To JAMES HUME, Esq., Hony. Secy. A. and H. Society.

SIR,—I have the honor to return the translation by Mr. Fenwick, of a work on an improved system of Agriculture, which I have carefully examined, as well as submitted to competent native authority, to ascertain the nature and quality of the Hindustanee. The report of Moulavees Akhbar Shaw and Mahomed Syied, I beg leave to enclose in original, with a translation; and as both those gentlemen are men of acknowledged learning and ability, their opinion can be depended upon by the Society.

As respects the matter itself, it appears to me correct, and to convey European notions upon the subjects discussed in a Vernacular medium, so as to be quite intelligible to any native agriculturist of ordinary information and education. The English expressions are very properly orientalized, and, in some cases, with a creditable degree of elegance and excellence. There are numerous verbal errors, which are, most likely, the fault of the copyist, but which will require to be carefully corrected, if the work should be printed by the Society.


The translation is, certainly, worthy of being patronized by the Society; but whether it be deserving of Mr. Tucker's prize and fulfils his intentions in offering a reward, I do not consider myself competent to decide—my acquaintance with Agriculture and Hindustanee not being sufficiently extended to permit of my doing so conscientiously.

I have, &c.,

(Signed.) F. J. MOUAT, M.D.

Medical College, January 4th, 1845.

It was agreed, with reference to the closing portion of Dr. Mouat's letter, that the manuscript be forwarded to Mr. Tucker, and that he be requested to favor the Society with his opinion thereon, or with the opinion of any other party who may be competent to speak of the usefulness of the work in an Agricultural point of view. Further, that Mr. Fenwick be requested to submit an English version of the work to the Society.



Proceedings of Branch Societies.

Letters were read from the Secretaries of the Branch Societies of Cuttack, Baugelpore, Lucknow, and Simla, reporting the progress of their respective institutions. Captain Dunlop incorporates, in his communication, an account of various cultures in the Cuttack garden, and gives the result of the exhibition of vegetables which took place on the 25th of December last. Major Napleton encloses an account of the show of vegetables, flowers, &c., which was held at Baugelpore on the 16th January, and gives the names of twelve new subscribers, since his last report of the 19th of November. Captain Hollings forwards an account of the meeting, which took place on the 20th December, of the members of the Lucknow Branch Society, and a long and interesting report regarding the state of the garden under his charge; and Dr. Corbyn presents a copy of the proceedings respecting the establishment of a Branch Horticultural Society and Garden at Simla.

The above communications were referred to the Committee of Papers for publication in the journal.

Communications on various subjects.

The following letters and papers were also submitted :—

1. From C. Beadon, Esq., Under Secretary, Government of Bengal, transmitting copy of a report, with enclosures, from the Commissioner of Arracan, regarding certain teak-producing localities in that province.

2. From Dr. A. Campbell, presenting a Gardener's Calendar for Darjeeling.

3. From W. Limond, Esq., Secretary Chamber of Commerce, forwarding, by desire of the Chamber, a communication from Mr. Southey on the subject of improving the breed of sheep in India.

4. From A. Sconce, Esq., presenting a paper on the relative position of landlords, tenants, produce, labour and wages in India and England.

5. From C. B. Taylor, Esq. forwarding a piece of rope made from the fibres of the jeetees (*Asclepias tenacissima*), and giving a few particulars regarding it.

6. From Capt. T. E. Rogers, Master Attendant, enclosing a memorandum descriptive of the result of experiments made with the jeete rope, &c.

7. From Lieutenant W. F. Nuthall presenting a catalogue of the collection of woods indigenous to Arracan, forwarded by him in September last.

8. From Dr. Alexander Grant, presenting a few drawings, with letter press, descriptive of the Chinese method of tile and brick making, of burning shells for lime, and of expressing oils.

9. From Dr. M'Clelland, forwarding analyses by Mr. J. G. Scott, of the soils from the Tenasserim Coast, presented by Mr. O. Riley, and expressing his approval of them.

10. From C. Beadon, Esq., Under Secretary Government of Bengal, forwarding copy of a report on the teak forests on the Thoungyeen River, Tenasserim Province.

All the above communications were referred to the Committee of Papers.

11. From H. Giraud, Esq. Secretary to the Agri-Horticultural Society, Bombay, agreeing to the proposal of publication in this Society's Journal of papers presented to them.

12. From G. G. Mercer, Esq., alluding to the circumstance of grain keeping free from weevil, when preserved in jars, which have been prepared by baking *in the sun*.

13. From Major C. G. Dixon, Superintendent of Ajmere, intimating that the small supply of American maize, transmitted to him last year, has given returns so superior to the indigenous maize of Ajmere and Mhairwarra, that he is desirous of being furnished with a much larger quantity for distribution next season.

The Secretary mentioned, that he had forwarded to Major Dixon several seers of the acclimated American maize, from the Nursery garden.

14. From L. Wray, Esq. offering his services to procure for the Society a few plants and seeds, from the Royal Agricultural Society of Jamaica, of the guynep, star apple, calabash, &c.

Referred to the Garden Committee.

For all the above communications and presentations, the best thanks of the Society were accorded.

A correspondence between Mr. Robison and Dr. Mouat, and a letter from Dr. Mouat to the Secretary, regarding a drawing of the Metcalfe Hall, which has been prepared by Mr. Clarihew, was also submitted. Also a letter dated 18th January 1845 from Mr. Clarihew to Dr. Mouat, furnishing, by desire of Dr. Mouat, copy of his (Dr. M's.) letter to Mr. Clarihew, requesting him (Mr. C.) to make a sketch of the Metcalfe Hall for the purpose of reducing it to form a vignette on the title page of the Society's Journal. After some discussion it was agreed, that Mr. Clarihew's claim of two hundred rupees, as his remuneration for the drawing, be liquidated.

(Wednesday, the 12th of March, 1845)

The Hon'ble Sir J. P. Grant, President, in the chair.

The proceedings of the February meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last meeting were duly elected members of the Society; viz:—

Messrs. J. P. Gubbins, W. A. Rolfe, G. L. Young, Brian Hodgson and C. C. Bruce, Baboo Debendernauth Tagore, Nursingchunder Bhose, Nobinchunder Bhose and Hemnaut Roy.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for Election.

H. Atherton, Esq., C. S. Pubna—Proposed by Mr. A. Sconce, seconded by Mr. F. Stainforth.

E. L. Brandreth, Esq., C. S. Ajmere—Proposed by the Secretary, seconded by Mr. M. Wylie.

Lieut. A. L. MacMullin, (23d N. I.)—Proposed by Major T. E. A. Napleton, seconded by the Secretary.

C. Congreve, Esq., Merchant, Calcutta.—Proposed by Mr. E. L. Ryder, seconded by Mr. W. G. Rose.

George May, Esq., (Firm of Saunders, May, Fordyce, and Co.).—Proposed by Dr. Hufnagle, seconded by Mr. L. Balfour.

Presentations to Library.

1. Report of the Bombay Chamber of Commerce, for the first quarter of 1844-45. *Presented by the Chamber.*

2. Journal of the Asiatic Society of Bengal, No. 68. *Presented by the Society.*

3. The India Journal of Medical and Physical Science, Nos. 2 and 3 of vol. 3.—*Presented by Dr. Finch.*

GARDEN AND MUSEUM.

1. A small quantity of the seed and pods of the American Sumach or Dividivi, (*Cæsalpinia coriaria*) the produce of the Botanic Garden. *Presented by Dr. Wallich.*

The Secretary mentioned that he was about transmitting small supplies of this seed for the gardens of the Branch Societies of Lucknow, Baugleapore, Cuttack, &c., and to a few members in other parts of the country, who had expressed their willingness to give a fair trial to any seeds that might be occasionally furnished to them and to report the result to the Society.

2. Sample of Cotton from the Government cotton farm at Gor-ruckpore. *Presented by H. C. Tucker, Esq.*

2. Samples of Cotton in pod, in *kuppas*, and in a cleaned state; all the produce of Upland Georgia seed. *Presented by Major T. E. A. Napleton, Secretary Baugleapore Branch Society.*

3. Sample of cotton grown at Bejepore factory, Buxar, from Mexican seed furnished to him by the Society. *Presented by P. P. Carter, Esq.*

The Secretary submitted a report on all the above samples, which had been obligingly drawn up by Mr. James Potter. He mentioned that extracts therefrom had been furnished to the respective donors, and that, with the sanction of the meeting, he would transfer it, and the letters connected therewith, to the Committee of Papers for publication in the Journal. This was agreed to.

4. Two samples of potatoes, the result of an interesting experiment lately made in his garden at Cossipore. *Presented by William Haworth, Esq.*

5. A tree of the *Urhur Dall*. *Forwarded for inspection by Capt. J. A. Currie.*

Capt. Currie states that this tree is the produce of a stray seed which was by mistake included in a packet of flower seeds sent from the Cape. The seed was planted in October 1842, and took between 16 and 17 months in ripening its seed, by which time it had attained the height of 14 feet, and a circumference of 10 inches at the root of the stem, the branches extending about 5 feet on each side. On counting the seed, Capt. Currie found that the tree had given an enormous produce, nearly 11,500 fold, which is about twenty times more than is yielded by the Indian tree; the latter, however, only requiring half the time, of the other (from 8 to 9 months) to ripen its seed. Capt. Currie presents a quantity of the seed, but from the time it has taken to come to perfection, he thinks it is questionable whether the cultivation of the "Cape dall," in India, would be of advantage.

6. A small supply of cauliflower seed, from the garden of the Cuttack Branch Society. *Presented by Capt. W. W. Dunlop.*

Exhibition of Celery.

A list of the prizes which were awarded at the exhibition of celery on the 11th of March, from the amount placed at the disposal of the Society, by Mr. W. P. Grant, was read. In the remarks appended to the list it is mentioned that there were altogether about 25 baskets, but with the exception of 5 or 6, all the samples were inferior, wanting in firmness of stalk and not sufficiently blanched. The sample for which the first prize was given was very superior to all the others, but not sufficiently well cultivated to induce the Committee to award the sum which had been originally fixed, namely, sixty-four rupees. For the same reason the rewards for the second and third best specimens were reduced from 16 and 8, to 10 and 5 rupees. Small prizes of two and one rupees were given, to all the other samples not for their goodness, but with the view of inducing the *malees* to pay greater attention to this vegetable and to exhibit a better result at the next or May show. The Committee, some months ago, circulated a paper in Bengalee, on the mode of cultivating celery by the European process of planting out in trenches, and earthing up as the plant grows, but most of these samples appeared to have been grown after the old native

fashion of loose earthen tubes, and as a consequence, the stalks were weak, pipey and wanting in whiteness of colour. The total amount awarded on this occasion was 61 rupees.

Floricultural Exhibition.

A list of prizes amounting to 78 rupees which were awarded at the flower show on the 14th of February last, was next submitted. It is stated that there was altogether a varied display of exotics. The heartsease, passifloras, pentstemon, clarkias, variegated larkspurs, antirrhinums, petunias, and euphorbias, afforded perhaps the best specimens. Some tolerably good plants of *Astrapea Wallichii*, begonias, and maranda barclayana were also shewn, as also fair specimens of the poivreia coccinea, coreopsis, pinks, narcissus, German aster, oxalis of three or four kinds, phlox drummondii, &c. &c. There was but a poor show of dahlias, it being almost too late in the season for them; the geraniums also were confined to five kinds; the violets were poor in quantity, and with two or three exceptions, in quality also. Prizes were offered for sweet peas, escholtzias, auriculas and primroses, but there was not a single specimen of any of these varieties. The wall-flowers and lupins were very inferior.

The display of indigenous flowers was not equal to that of exotics. The ixoras, goldfussias, and roses were in larger quantity than other varieties; prizes were given for them, and for best specimens of eranthemums, and of the orchideæ and malvaceæ.

The Garden Committee also submitted a list of the flowers for which prizes are to be awarded at the next show. The Committee suggest that the show be held on the 15th of April next, at 11 o'clock, and that the judges be requested to meet two hours previously to arrange the prize specimens. The day and hour of meeting was agreed to.

Tribute of Respect to the Memory of the late William Griffith, Esq.

The Secretary having previously drawn the attention of the members to the circumstance of the melancholy intelligence, which had been received since the last meeting, of the demise at Malacca of Mr. William Griffith, late a Vice-President of the Society, begged to submit the following letter, from Mr. McClelland with the memoir therein referred to:—

To JAMES HUME, Esq., Hony. Secy, Agri-Horticultural Society.

MY DEAR SIR,—On receipt of the painful news of the death of Mr. W. Griffith, I wrote to Mr. Ridsdale to discontinue, or at least suspend the printing of the 21st number of the Journal of Natural History, until I should make up my mind as to whether to continue it under the painful circumstances or not.

I have now resolved to abandon it, particularly as it was chiefly undertaken in the first instance to afford him and his friends a channel of publication in their own interest. He leaves so great a

blank here in the branch of science he represented that it may easily be understood from what was said in the preface of the 20th number of the Journal of Natural History, we could not carry that work on without him.

I should be happy, therefore, to transfer such papers as are on hand (connected with plants) to the Journal of the Agri-Horticultural Society, it being my intention to make a similar offer of papers on other subjects to the Journal of the Asiatic Society.

I should also be happy to offer to the Society, with a view to raise a fund for the publication of Mr. Griffith's extensive MSS. the remaining sets of the Journal of Natural History, probably 50 or 60 which if gradually sold, as they might be in the course of a few years at their published price, would raise a fund of some 3 or 4 thousand rupees. I have no doubt some measures will be taken in England with the view to the publication of his labours. It may be premature to enter upon the question at present, but I should be glad to receive the answer of the Society, as to whether it would be compatible with its object to accept the above offer with such a view.

I take the same opportunity of submitting a sketch of what I know of his services and occupations in India, to lay it before the Society, or to print it in the Journal, or in any shape the Society may wish.

Sincerely yours,

12th March 1845.

J. McCLELLAND.

At the close of the perusal of the above letter, the following resolution was submitted by the Secretary, seconded by Rajah Radakant Deb Bahadoor, V. P. and unanimously agreed to:—

“That the Society is deeply sensible of the loss it, as well as the science of botany, has sustained in the death of William Griffith Esq., one of the Society's most valuable members. It readily accepts the charge tendered by Mr. McClelland of the surplus numbers of the Journal of Natural History, and offers its best thanks to him for the memoir of his late friend.”

Communications on various subjects.

The following letters and papers were also submitted:—

1. From C. Beadon, Esq., Under Secretary Government of Bengal, forwarding copy of a second communication from the Commissioner of Arracan, shewing the existence of teak trees on the borders of the Thaddi stream, near Sandoway.

2. From A. Shakespear, Esq., Assistant Secretary to Government N. W. P., placing at the disposal of the Society by direction of the Hon'ble the Lieutenant Governor, extracts from reports by Mr. Blount, the American planter, regarding the cotton farm at Goruckpore.

3. From Capt. G. E. Hollings, Secretary of the Lucknow Agricultural Society, enclosing an account of their first Horticultural exhibition, held on the 12th of February.

4. From F. Nicol, Esq. Chandpore factory, Jessore, giving a tabular statement of the produce obtained from certain varieties of sugar cane.

The above letters were referred to the Committee of Papers.

5. From J. G. Bruce, Esq. dated Cawnpore, 31st January, requesting the assistance of the Society in procuring him a large supply (125 maunds), of cotton seed with the view of making an experiment on an extended scale, in the vicinity of Culpee.

Mr. Bruce offers to remit the amount cost of the seed, in the event of the Society being able to procure it for him, to undertake the experiment at his own cost, and to report the result of it to the Society at the end of the season.

The Secretary mentioned that the Society had not at present any cotton seed in store. Dr. Hufnagle, who was present, intimated that he had a large supply of American seed, and if on trial it should prove to be good, he would be happy to place the whole of it at the disposal of the Society. The thanks of the Society were returned to Dr. Hufnagle for his kind offer, and the Secretary was directed to inform Mr. Bruce of the same.

6. From H. Fenwick, Esq. intimating his readiness to meet the Society's request for an English translation of his *Hand-book of Agriculture &c.* in the event of the latter meeting the approval of Mr. H. C. Tucker, to whose decision the work has been referred by the Society.

Notice of Motion.

At the close of the meeting the Secretary called attention to the circumstance of a member of the Society having declined to pay his subscription for the period of his residence at the Cape. The subscription of members visiting the Cape had hitherto been always continued in virtue of the sixth article of the regulations which provides that "Members whose absence from India *beyond* the Cape is merely temporary, shall continue to be borne on the list of members, but shall be exempt from the payment of subscriptions,

from article 6 of the regulations of the Society.
A bill of Messrs. Currie and Co.'s for 641 rupees, the balance of their account for furniture for the Society's apartments at the Metcalfe Hall, was submitted, from the Finance Committee, and passed for payment.

Moon's Changes

Inches	Barometer.			Direction.
	Of the Mer- cury.	Of the Air.	Of an Evapp. Surface.	
30,161	66.4	67.0	65.4	N. W.
138	66.5	66.0	64.0	N. W.
170	66.5	66.5	65.0	N. W.
133	67.0	68.0	66.5	N. W.
246	68.0	67.8	77.0	N. W.
310	68.5	69.0	68.2	N. W.
286	70.5	71.0	70.0	N. W.
278	70.9	70.0	68.5	N. E.
266	69.0	69.0	67.5	N. E.
333	68.5	69.0	67.5	N. E.
354	70.2	70.0	69.0	N. E.
284	70.5	72.0	70.8	E.
126	70.4	71.0	69.7	N. E.
178	70.5	71.5	70.2	W.
230	69.5	70.0	69.0	W. S. W.
241	68.4	68.0	67.7	N. W.
238	71.0	74.8	70.7	S. W.
217	72.0	74.0	71.0	S. W.
245	72.0	76.5	72.5	N. E.
157	71.5			S. W.
170	76.2	77.5	75.0	S. W.
157	72.0	72.0	68.2	N. W.
162	73.8	75.4	69.0	E. W.
165	73.8	74.5	69.5	W.
132	71.0	72.5	67.0	E. (sharp)
129	76.0	76.5	66.5	E.
153	70.4	71.5	66.0	E.
214	64.0	64.0	62.5	W.
120	69.5	71.5	67.8	E.
100	67.5	68.2	65.7	E.

Inches	Barometer.			Direction.
	Of the Mer- cury.	Of the Air.	Of an Evapp. Surface.	
30,117	70.0	72.0	69.8	N. W.
1098	70.3	72.0	69.0	N. W.
117	70.0	72.0	69.8	N. W.
1089	69.5	72.0	70.0	N. E.
210	71.0	72.8	71.5	N. W.
269	71.4	74.0	73.4	N. W.
262	73.0	76.0	73.8	N. W.
229	73.2	75.8	72.7	W.
217	73.0	74.5	71.4	N. W.
286	71.9	74.4	71.8	N. W.
289	71.0	76.0	72.0	N. E.
254	72.8	77.0	74.5	E.
176	73.5	76.0	74.0	W.
133	74.0	78.4	72.5	W. S. W.
200	72.0	74.0	71.0	W. S. W.
202	73.0	79.0	72.5	S. W.
212	73.5	80.2	72.8	S. W.
200	75.0	79.2	73.0	W.
173	75.0	82.7	69.5	W.
142	81.5	87.0	69.7	S. W.
125	79.5	81.4	68.5	N. E.
135	80.0	79.6	69.0	N. E.
138	80.5	80.5	73.8	S.
118	80.0	79.8	69.0	S. E.
113	81.8	81.6	69.0	S. E.
130	76.4	79.0	67.6	N. W.
109	79.0	68.3	64.7	S. E.
108	79.0	68.5	69.7	S. W.
1078	71.0	71.2	67.4	N. E.

Inches	Barometer.			Direction.
	Of the Mer- cury.	Of the Air.	Of an Evapp. Surface.	
30,035	72.2	82.0	73.8	N. W.
1030	73.0	80.0	78.7	N. W.
1018	72.7	80.0	78.0	N. W.
1033	71.0	82.0	75.7	N. E.
160	73.5	82.0	76.4	N. W.
229	74.4	83.0	77.0	W.
200	76.5	85.0	77.0	S. W.
196	75.0	86.0	76.4	N. W.
170	75.0	80.4	77.0	W.
238	74.5	79.8	77.0	N. E.
250	74.2	81.0	78.2	N.
180	76.3	81.0	77.0	W.
1085	77.0	81.0	76.8	W. S. W.
1065	78.0	82.0	78.7	W. S. W.
117	76.0	81.0	72.0	W.
118	76.0	81.4	70.5	W.
120	77.4	83.5	72.0	W.
116	76.5	83.0	71.8	N. W.
112	78.0			W.
1062	84.0	83.8		S.
1053	84.7	84.0	73.0	S.
1070	84.2	83.5	69.5	W.
1080	84.5	83.5	75.4	S.
1065	84.5	83.9	70.5	S.
1059	84.0	82.5	69.8	S. E.
1072	83.0	83.1	70.0	S. W.
1074	81.0	79.9	70.0	S. W.
1069	76.8	79.1	67.0	E.
29,991	81.4	80.3	72.8	N. W.
1014	71.0	71.4	66.4	E.

Inches	Barometer.			Direction.
	Of the Mer- cury.	Of the Air.	Of an Evapp. Surface.	
30,041	72.0	74.5	72.4	Calm.
1061	72.8	73.0	72.2	N. W.
1064	72.0	74.0	72.5	W.
1044	71.0	76.0	74.9	Calm.
166	73.0	77.0	76.0	Calm.
223	74.0	76.8	77.0	Calm.
205	76.2	78.0	76.5	Calm.
177	74.5	79.0	76.5	Calm.
184	75.0	78.0	76.0	Calm.
222	74.0	78.0	76.0	W. S.
250	74.0	78.0	77.0	N. W.
190	76.0	78.0	76.8	N. W.
1082	77.4	77.4	71.5	S.
130	76.4	76.0	69.0	Calm.
120	75.3	77.4	70.6	Calm.
125	77.3	78.8	71.6	Calm.
122	78.8	80.0	71.0	N.
117	78.5			Calm.
1062	80.8	79.7	70.5	S. W.
1050	80.0	80.0	70.5	S.
1070	80.2	78.5	69.5	Calm.
1077	81.4	79.6	74.4	Calm.
1058	81.0	79.2	70.8	Calm.
1058	80.5	80.0	69.2	S. W.
1052	80.8	78.9	72.0	W.
1060	78.0	76.3	69.0	Calm.
1079	74.4	72.4	67.5	Calm.
29,998	76.8	74.0	69.5	S.
1009	70.5	70.1	67.0	..

Upper.
Lower.

0.37
0.06
0.34
0.06

Meteorological Register kept at the Surveyor General's Office Calcutta, for the Month of February,

Days of the Month.	Observed at 9 H. 50 M.					Observations Made at Apparent Noon.					Observed at + P M.					Observations Made at set.					
	Moon's Changes.					Temperature.					Temperature.					Temperature.					
	Barometer.	Of the Mer- cury.	Of the Air.	Of an Evapg. Surface.	Wind.	Barometer.	Of the Mer- cury.	Of the Air.	Of an Evapg. Surface.	Wind.	Barometer.	Of the Mer- cury.	Of the Air.	Of an Evapg. Surface.	Direction.	Barometer.	Of the Mer- cury.	Of the Air.	Of an Evapg. Surface.	Direction.	
1	Inches 30.011	71.8	73.0	69.4	N. E.	29.974	75.5	76.0	70.5	N.	29.897	81.4	80.5	71.5	W.	29.889	77.5	77.0	72.0	N.	
2.	.028	73.5	74.6	69.5	W. ... S.	.996	79.5	79.2	71.0	W. ... S.	.893	84.0	83.0	72.0	N. ... S.	.897	79.5	78.8	71.0	W. ... S.	
3.	.007	74.9	76.0	71.0	W. ....	.969	81.2	81.6	71.5	W. ....	.865	84.0	83.4	70.5	W. ... S.	.878	80.0	80.0	77.0	N. ... W.
4	.028	74.9	75.5	70.5	N. ....	.977	81.0	81.5	73.0	N. ....	.894	84.8	84.2	71.2	N. ....	.896	81.0	80.0	74.0	N.
5	.049	76.0	78.0	68.0	N.	30.017	81.0	81.8	66.0	N. ... W	.944	85.0	84.2	65.4	N. ....	.949	80.8	70.2	60.2	N.
6	.113	74.0	75.8	62.5	N. ... W.	.086	79.8	80.0	66.0	N. ....	.995	83.0	82.0	64.5	N. ....	.996	79.0	76.0	63.0	N.
7	.117	73.0	74.0	61.5	N. ....	.083	77.0	76.7	60.0	N. ... W	30.010	82.0	81.0	64.0	N. ... W.	30.011	78.5	78.0	64.0	N. ... W.
8	.118	71.0	71.8	61.0	N. ... W.	.082	79.0	79.0	59.4	N. ... W	29.990	82.0	81.0	62.5	N. ... W.	29.992	78.0	76.5	60.0	N. ... W.	
9	.101	78.0	75.0	59.0	N. ... W.	.060	79.0	79.0	59.4	N. ... W	30.002	82.3	81.8	62.0	N. ... W.	30.016	78.2	76.0	62.0	N. ... W.	
10	.150	70.5	72.0	61.0	N. ... W.	.080	78.0	77.5	63.0	N. ... W	.933	84.5	83.0	71.0	N. ... W.	.961	79.5	78.5	70.0	N. ... N.	
11	.078	72.0	73.4	67.0	N. ... W.	.096	79.5	79.8	67.0	N. ... W	.986	82.5	82.0	67.0	N. ... W.	30.001	79.0	79.2	67.0	N. ... W.	
12	.133	73.0	73.6	63.0	N. ... W.	.049	81.0	80.8	64.0	N. ... W	.966	84.0	83.0	66.0	N. ... W.	29.972	80.5	79.5	63.0	N. ... W.	
13	.097	74.3	75.7	65.0	N. ... W.	.089	81.0	81.0	65.0	N. ... W	.956	84.5	83.5	63.5	N. ... W.	.977	80.0	78.5	63.0	N. ... W.	
14	.101	74.0	75.0	61.5	N. ... W.	.048	82.5	83.0	71.0	S. ... E	.956	87.8	86.0	63.0	N. ... E.	.962	83.0	79.0	65.0	N. ... W.	
15	.080	74.0	76.6	65.5	S. ... E.	.078	83.9	83.0	67.4	S. ... E.	.988	89.0	88.0	66.0	S. ... E.	.986	83.5	81.0	65.9	S. ... E.	
16	.063	76.5	78.0	66.5	S. ... E.	.010	79.0	79.5	72.5	N. ... E	.925	80.5	81.0	68.0	N. ... E	.924	77.2	76.3	65.0	N. ... E.	
17	.021	74.0	73.8	71.4	S. ... E.	.024	79.0	79.0	70.5	67.0	N. ... E	.932	78.0	76.5	70.2	N. ... E.	.932	76.0	75.0	70.2	N. ... S.
18	.065	75.0	66.0	64.5	N. ... E.	.014	79.0	79.5	73.0	N. ... E	.948	82.5	81.4	71.0	N. ... E.	.910	80.0	79.7	75.5	N. ... E.	
19	.046	74.0	74.4	70.5	N. ... E.	.007	80.0	80.0	67.5	N. ... E	.896	84.0	83.5	68.8	N. ... W.	.899	80.7	80.0	66.0	N. ... W.	
20	.040	74.0	73.8	67.0	N. ... W.	.014	74.0	74.8	68.0	N. ... W.	.911	76.2	76.8	66.4	N. ... W.	.952	75.2	74.8	67.0	N. ... W.	
21	.087	74.5	74.5	66.0	N. ... E.	.025	80.5	81.0	68.0	N. ... E	.911	86.0	85.0	67.0	N. ... E.	.912	82.5	81.4	68.0	N. ... E.	
22	.087	74.4	74.2	67.5	N. ... E.	.014	80.5	82.0	70.0	N. ... E	.932	79.5	80.4	68.0	N. ... E.	.924	78.0	77.0	67.5	N. ... W.	
23	.030	74.2	75.0	65.0	N. ... W.	.016	81.6	81.8	67.8	E. ....	.946	86.5	76.0	70.0	N. ... E.	.926	82.5	81.8	70.0	N. ... E.
24	.073	71.5	73.0	65.0	N. ... W.	.036	78.0	78.5	66.0	N. ... E	.917	84.0	83.5	67.5	N. ... E.	.941	79.0	77.0	68.0	N. ... W.	
25											.940	82.5	82.0	67.0	N. ... W.						

0.33
0.50
0.02

Monthly Proceedings of the Society.

(Wednesday, the 9th of April 1845.)

The Hon'ble Sir J. P. Grant, President, in the Chair.

The proceedings of the last general meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last meeting were duly elected members of the Society, viz :

Messrs. H. Atherton, E. L. Brandreth, C. Congreve, George May, and Lieutenant A. L. MacMullen.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :—

Captain S. R. Tickell, Asst. Commr. of Chota Nagpore—proposed by Lieut.-Col. J. R. Ouseley, seconded by the Secretary.

W. H. Bradley, Esq., Medical Service, Ellichpore—proposed by the Secretary, seconded by Dr. Hufnagle.

T. F. Henley, Esq., Merchant, Calcutta—proposed by the Secretary, seconded by Dr. Hufnagle.

Presentations to the Library.

1—Nos. 12 and 13, and part 1 of No. 15 of the Journal of the Royal Asiatic Society of Great Britain and Ireland. *Presented by the Society.*

2—The first half-yearly volume of the Transactions of the Royal Agricultural Society of Jamaica, and a copy of eight practical treatises on the cultivation of the sugar-cane, written to compete for the prize of £100 offered by the Governor of Jamaica. *Presented by the Society.*

3—The India Journal of Medical and Physical Science, No. 4. of vol. 3. *Presented by Dr. Finch.*

Garden and Museum.

1—Samples of gum from the *Acacia catechu* ; of frankincense from the *Boswellia thurifera* ; and of the concentrated juice of the *Peasal*, (*Pterocarpus marsupium*?) all the produce of the Palamow jungles. *Presented by C. B. Taylor, Esq.*

2—A beautiful piece of goat-skin, tanned solely with pods of the American Sumach (*Cæsalpinia coriaria*,) the produce of the H. C. Botanic Garden. *Presented by Dr. Wallich.* •

(Further particulars regarding this experiment will be found in the body of the proceedings.)

3—A quantity of the roots of the *Kapoorée* or *Parhee*, (*Cissampelos convolvulacea* of Wight and Arnott.) *Presented by Col. H. C. M. Cox.*

Col. Cox brings this root to the notice of the Society, in consequence of his having been informed, on very excellent authority,—proved by repeated trials—that it is a complete specific for the bites of the most venomous snakes. Col. Cox states, that “A small piece of the root, about an inch long, is bruised down, with about 20 black pepper corns, and given with a little water to the patient; it causes profuse foaming at the mouth, and the dose is to be repeated at short intervals, two or three times; the patient is also to be kept in active bodily motion, till all symptoms of lethargy are removed.”

In reference to the above, the Secretary submitted a suggestion from Dr. Mouat, to the effect, that a portion of this root be sent to Mr. Robertson, the Society's chemical analyser, and the remainder forwarded through the Medical Board to the Surgeons of the three principal hospitals (General, Native, and Medical College,) with the view of obtaining a decided report on the virtues which it is stated to possess. This suggestion was agreed to.

4—An assortment of cypress, pine, cedar, and other hill seeds, from the Saharunpore Botanic Garden. *Forwarded by Dr. Jameson.*

5—Specimens of vegetables, the produce of the Baugulpore Branch Society's Garden, consisting of potatoes, grown from Darjeeling seed; carrots; French white runner and Windsor beans; artichokes and mangul wurzul. *Forwarded by Major T. E. A. Napleton.*

The Secretary mentioned that the above reached, unfortunately, just two days after the last meeting, and could not be preserved for the present meeting. The potatoes and artichokes were excellent specimens, superior perhaps to any exhibited at the Society's exhibition, while the carrots and Windsor beans were fully equal to Calcutta produce. The French and white runner beans were also very fair samples, and the mangul wurzel roots of a fine size.

Exemption to Members from subscription while resident at the Cape.

The motion of which notice was given by the Secretary at the last meeting, to the effect that the words “beyond the Cape,” be in future

omitted from article 6 of the Regulations of the Society, was brought forward, seconded by Dr. Huffnagle, and unanimously agreed to.

The Sugar Planters' Companion.

The minutes of the Members of the Sugar Committee and Committee of Papers, to whom was referred, conjointly, the subject of a motion given by Mr. W. Storm, at the January meeting, respecting the treatise entitled the "Sugar Planters' Companion," which has been published in the Society's Journal,—were next read. Whereupon it was moved by Mr. Staunton, seconded by Dr. Huffnagle, and resolved, "That on the Report of the Committee, to whom the subject was referred, Mr. Wray be presented with the sum of three hundred rupees, in acknowledgment of his labour in the production of the work in question."

Horticultural Exhibition.

A report from the Fruit and Kitchen Garden Committee, regarding the next show of vegetables and fruits, was submitted. The committee propose, that the show be held on Tuesday, the 13th of May, at 7 A. M. and give a schedule of prizes, amounting to 147 rupees and two silver medals, to be awarded on that occasion. The committee also offer a few other suggestions in regard to the arrangement, &c., of specimens which, together with the day proposed for meeting, were agreed to. The committee were requested to officiate as judges on the occasion. It was at the same time agreed, that the following gentlemen, viz., Messrs. C. K. Robison, R. Dodd, G. T. F. Speede, and W. G. Rose, should be requested to act as judges at the flower show, which is to be held on Tuesday the 15th instant.

Nerbudda Wheats and White Linseed.

The Secretary mentioned, that he had received from various quarters favorable accounts respecting the Nerbudda wheats and white linseed, of which so splendid a supply was furnished to the Society last year by Lieut.-Col Ouseley. Major Napleton, Secretary of the Banglepore Branch Society, writes as follows regarding them :—" In reply to the 2nd para. of your communication, I am delighted to tell you the crop of white linseed now growing so luxuriantly in the public garden, will be the means of furnishing many of the large farmers in the adjacent districts

with seed for next season, and the Nerbudda wheat (which has also attracted an immense deal of attention far and near) is growing to the extent of three-quarters of a beegah in my garden most luxuriantly, and the produce will be most gratefully reserved for next season's sowings by the rich as well as the poor agriculturists."

Mr. Peter Palmer, writing from Monghyr, observes—"The wheats are progressing capitally, and the small fields are a luxury to look at. You shall have a paper on the subject as soon as I have harvested;" and Captain Hollings, Secy. of the Lucknow Society, in a letter, dated 12th January, states—"The wheat from the Nerbudda, given to the Society by Colonel Ouseley, is thriving admirably, and promises to yield an abundant crop."

Experiment with Sumach, the produce of the Botanic Garden.

A communication from Dr. Wallich, forwarding extracts of letters to his address from Mr. Teil, with the specimen of leather referred to among the presentations, were next submitted. Dr. Wallich mentions, that these reports are based on experiments made by Mr. Teil on a quantity of Sumach, the produce of the *Cæsalpinia coriaria*, grown in the Botanic Garden.

In one of his communications Dr. Wallich recommends an extensive cultivation of the tree in this country. He says—"It seems to thrive remarkably well, requiring very little, if any care, except in its youngest state, and a proportionally small expenditure of money. The tree seems to be contented with a very ordinary sort of soil; and in all probability, when once reared from seeds ripened in the country, it will be as productive as in its own native climate—at least sufficiently productive to make the cultivation of the tree an object of importance;" and he adds, "Again I recommend this Sumach to be widely cultivated in this part of the world. I have sent seeds to Madras, Ceylon, and Bombay, and to many places in Hindostan."

The Secretary mentioned that, in addition to the supply of seed which was placed on the table at the last meeting, Dr. Wallich had, at his request, obligingly furnished him with a further quantity, which had enabled him to distribute it not only to the Branch Societies, but to many of the members in various parts of the country, and there was still a small surplus available to any parties disposed to give it a trial.

The thanks of the Society were directed to be given to Dr. Wallich for his interesting communication and extracts, which were referred to the Committee of Papers.

Communications on various subjects.

The following letters and papers were also submitted :—

1—From Cecil Beadon, Esq., Under-Secretary Government of Bengal, forwarding two communications from the Sudder Board of Revenue, regarding the cultivation of cotton, and various other staples in the district of Rungpore.

2—From H. C. Tucker, Esq., transmitting some correspondence connected with the cultivation of cotton at the Government Farm at Goruckpore.

3—From A. Sconce, Esq., enclosing a memorandum regarding cotton cultivation in the district of Chittagong.

4—From Dr. J. V. Thompson, at Sydney, dated 18th January 1845, furnishing a few further remarks respecting the Mauritius and other varieties of Sugar-cane.

(The above communications were referred to the Committee of Papers.)

5—From Dr. Wallich, Superintendent H. C. Botanic Garden, enclosing copy of his correspondence with Government, regarding the Society's application for the extension of ground for its Nursery, situated in the Botanic Garden ; from which the Society are informed, that the Governor of Bengal has no objection to the grant of the additional piece of ground required by them for extending their nursery, provided they agree to certain conditions recommended to Government by the Superintendent of the Botanic Garden.

6—From R. S. Clarke, Esq., Honorary Secretary Royal Asiatic Society, forwarding the copies of the Journal of the R. A. Society, alluded to in the former part of the Proceedings.

6—From T. Bland, Esq., Secretary of the Royal Agricultural Society of Jamaica, transmitting the books noted under the head of presentations to the Library. It was directed, that the Journal of the Society be sent in return.

8—From Edward O'Riley, Esq., dated Amherst, Feb. 25th, animadverting on the regulation of Govt. of the 28th of December 1844, regarding the admission of Foreign Sugars into the Tenasserim Provinces, on the grounds, stated by him to be incorrect, of the local manufacture not being sufficient to meet the local demand. Mr. O'Riley observes, that from the very lowest average of statements now in his possession, he can prove that the cultivation of Sugar-cane has progressed, during the last seven years, from a few thousand plants to 25 millions of canes.

Letters were also read from Major T. E. A. Napleton, at Baugleporc; Mr. P. Palmer, at Monghyr; and Capt. G. E. Hollings, at Lucknow, expressive of their readiness to meet the wishes of the Society for grafts of superior varieties of fruit trees, with which to form a nucleus for the proposed orchard in the Society's Nursery Garden.

For all the above communications and presents, the best thanks of the Society were accorded.

(Wednesday, the 14th of May 1845.)

The Hon'ble Sir J. P. Grant, President, in the chair.

Members Elected.

The gentlemen proposed at the last meeting were duly elected members of the Society, viz.

Capt. S. R. Tickell, Dr. W. H. Bradley, and T. F. Henley, Esq.

Candidates for Election.

The following gentlemen were proposed as candidates for election :—

Lieutenant C. S. Reynolds (49th N. I.) Jun. Assistant Commissioner of Assam; proposed by Lieut. R. Campbell, seconded by the Secretary.

J. H. W. Cox, Esq., Nundungachee factory, Rajshaye, proposed by Mr. H. G. French, seconded by Mr. C. R. Jennings.

The Rev. Dr. Alex. Duff (Missionary Free Church of Scotland), proposed by Mr. M. Wylie, seconded by Mr. J. W. Laidlay.

The Hon'ble Mr. Justice Carr, Colombo, proposed by Sir Lawrence Peel, seconded by Sir J. P. Grant.

Presentations to the Library.

1. Second half-yearly volume of the Transactions of the Royal Agricultural Society of Jamaica. *Presented by the Society.*

2. Journal of the Royal Asiatic Society of Great Britain and Ireland. Part II. No. 15. *Presented by the Society.*

3. Journal of the Asiatic Society of Bengal. Nos. 69, 70 and 71. *Presented by the Society.*

4. The India Journal of Medical and Physical Science, No. 5, of vol. 3. *Presented by Dr. Finch.*

5. *Le Bon Jardinier* for 1845. *Presented by Messrs. Vilmorin and Co. of Paris.*

Garden and Museum.

1. Twelve Mango grafts from Bombay. *Presented by the Agri-Horticultural Society of Bombay.*

2. A small collection of grape vines, figs, and soursops. *Presented by the Agri-Horticultural Society of Madras.*

3. A plant of the Black stemless Date, from Surgooja. *Presented by Col. J. R. Ouseley.*

Col. Ouseley mentions, that he formerly sent some plants of this previously unknown species of Date to Dr. Wallich and the late Mr. Griffith. The one now presented to the Society, Col. Ouseley states, has fruited in his garden, and he adds, "It grows wild on the table-land of Surgooja, but is not found in Chota Nagpore. The Dates are eaten, and are very agreeable to the taste. The common *Phœnix acaulis* has yellow fruit, not eatable, on every stem *above* the plant, (i. e. the leaves.) The fruit of this is black, and clusters *close on the ground below* the leaves, around the plant, a fact in the history of the Date hitherto not obtained."

(Further particulars about the above trees will be found in the Garden Committee's report.)

4. A supply (about 50 seers) of Upland Paddy from Jushpore, a pergunah of Surgooja. *Presented by Col. Ouseley.*

Col. Ouseley describes this as a superior kind of rice, which, when boiled, becomes very long, and possesses a remarkably fine fragrant, almost aromatic scent. Mr. Haworth reports on this paddy as being a good grain, well grown, and in every respect a desirable quality, but there is nothing," he adds, "in its appearance, to make it more valuable than similar paddy grown in the neighbourhood of Calcutta."

5. A small supply of acclimated Mexican cotton seed from his experimental plantation at Bojepore, near Buxar. *Presented by P. P. Carter, Esq.*

6. A quantity of seed of the *Nerium* (Wrightea) *tinctorium*. *Presented by Dr. Robt. Wight.*

7. Two maunds of Madder seed from the south of France. *Forwarded by Messrs. Salavy and Co. of Marseilles.*

(For further particulars regarding this Mexican cotton, nerium and madder seed, see body of the Proceedings.)

8. A sample of Pouchong Tea, manufactured in 1844, at the Government factory, Hawaulbaugh, Kemaon. *Presented by Dr. Jameson.*

It was agreed to transfer a portion of this tea to the Assam Tea Company, and to request the favor of a comparative report thereon, with similar description of tea, the produce of Assam.

9. A quantity of Dahlia seed from the Deyrah Dhoon. *Presented by Capt. Kirke.*

10. A small box of tuberous roots from Lucknow. *Forwarded by Capt. Hollings.*

Capt. Hollings observes, that these roots are said to be those of the Salep Misree (*Orchis mascula*), and he sends them with the view of ascertaining the correctness of this supposition.

The Secretary mentioned, that he had sent these tubers to Dr. Wallich, who had recognised them as "a species of *terrestrial orchidea*, but states that they certainly are not the orchis root, or salep misree plant."

Nursery Garden : Cane plantation : experiments with Manures : Flower and Fruit tree Nurseries, &c.

The report first submitted was that from the Garden Committee. The committee state, that the late heavy falls of rain have considerably benefitted the cane plantation, and that all the plants, both on the new and old plots, are thriving vigorously, and give promise of an abundant crop this season: the total extent of cultivation is twelve beegahs, which it is anticipated will afford fifty thousand canes during the cutting season of 1845-46. The committee annex a statement regarding an experiment on cane with certain descriptions of manures, from which it appears that the plot applied with oil cake has given the largest produce; cow-dung comes second on the list; Penang and Peruvian guano the third and fourth, and tank earth the last. In regard to the guano, however, the committee express their conviction that, as in the case of previous experiments with American Maize, a sufficient quantity has not been given, and intimate that another experiment with double the quantity (16 lbs. to 2½ cottahs of ground) is now in progress, the result of which will be communicated in due course. The committee next mention, that two additional beegahs of ground have been added to the Flower garden, with the view of more fully meeting applications from members for plants and shrubs of rarer varieties; and suggest that a small sum be allowed to meet the cost of bell glasses, &c. They state, that six of the twelve mango grafts received from Bombay are in good condition, and have been planted out in the fruit tree nursery, and that directions have been given to plant out in the same spot, at the commencement of the rains, the supply from

Madras, which has all arrived in good order. The black stemless date, presented by Col. Ouseley, has recovered the effects of the journey from Chota Nagpore, and will also be shortly placed with the other fruit trees. The Committee lastly allude to the American maize and cotton plots, and to the various other cultures in the nursery, among them the Sumach plants raised from seed presented by Dr. Wallich, which are now ready for distribution; dahlia plants from Deyrah seed, which will be available next month; and to madder seedlings from the supply lately received from the South of France.

The report of the Committee was confirmed.

Exhibition of Flowers.

A list of prizes, amounting to 138 Rs., which were awarded at the floricultural exhibition on the 15th of April, was next submitted. In the remarks appended to this list, it is mentioned that the collection of flowers, indigenous and exotic, brought forward at this second quarterly show, was very good; much better than was generally anticipated, considering the unusually hot weather experienced at the close of March, and the heavy falls of rain in the early part of April. In the list of exotics, the geraniums, of which there were about nine or ten varieties, though two or three kinds only were in flower, the antirrhinums, consisting of five or six sorts, the petunias, pinks of ten kinds, saponarias, sweet Williams, centaureas, and heart's-ease, afforded the best specimens. There were also some good-looking plants of the *olea fragrans*, lavender, maurandias, verbenas and mesembryanthemum (ice plant;) and good cut specimens of variegated larkspur, passifloras of six or seven varieties, and roses, especially two kinds, the canina and carolina, which appear to have been only lately introduced here. There was a very indifferent show of thunbergias, hollyhocks, wall-flowers, coreopsis and gillias. Sweet peas, carnations, iris of sorts, and magnolias were mentioned in the list, but not a single specimen of any of them was brought forward: a portion of the prizes was therefore transferred to a very pretty plant of the *oxalis deppei*, and to cut specimens of the *jatropha pandurifolia*, *orthostemma roseum*, *justicia coccinea*, and a few others, as enumerated in the list. A prize was given to the mallee of Mr. C. McLeod, for two fine plants of the *sprekelia formosissima*, or Jacobæan lily, and two more prizes for the second and third best specimens of *amaryllis*. Among the indigenous flowers nearly all were cut specimens. Of ixoras, there were six or seven kinds, ten varieties of hibiscus, besides roses, lantanas, cassias, gardenias, clerodendron, baubinnias, &c. &c. The

bignonia equinoctialis, of W. I. origin, was the only specimen of that family exhibited. There was also only one cut specimen of the lagerstræmiæ, the *L. regina*; but as before remarked, neither in quantity nor variety did the indigenous assortment equal the foreign. Nevertheless the show was altogether an encouraging one, particularly in the large proportion of plants that were shown in pots to cut specimens.

Horticultural Exhibition.

A list of the prizes, amounting to 98 Rs. and a silver medal, which were distributed at the show of vegetables and fruits held on the 13th instant, was also brought to notice. Rather more than 200 mallees are stated to have been in attendance on the occasion. Among the European vegetables, the asparagus, onions, kale and parsnips, afforded perhaps the best specimens. The latter in particular were well deserving of the prizes which were given to the owners of them, it being a vegetable seldom if ever seen previously at the exhibitions, and is very seldom cultivated in Calcutta or its vicinity. There were several baskets of cabbages (sugar loaf and red varieties) of turnips, carrots, endive, and beet; some of them containing very fair specimens; a proof that these quarterly shows are likely to effect the object contemplated by the Society, namely, the bringing of our vegetables and fruits earlier into the market, and retaining them longer in season. Prizes were held out for squash, beans of sorts, and Brussels sprouts, but there was not a single specimen of any of these vegetables, and the amount was accordingly transferred to some good samples of horse-radish, mint, spinach, and a few other sorts. The specimens of artichoke and potatoes were too inferior to merit a reward. The celery also was very indifferent, notwithstanding the long notice that had been given of the handsome prizes available to producers of really good specimens. A trifle was awarded for this vegetable, merely with the view of inducing the cultivators to pay greater attention to it. Some excellent samples of maize, grown from American seed received from the Society, were exhibited. As regards the length of ear, number, size and regularity of grain, these were by no means inferior to the original stock, although grown out of season.

In the department of fruits, a silver medal was awarded for grapes, and a prize of 3 Rs. for a basket containing mangosteens and oranges grown at Allipore. There were several tolerable good specimens of peaches, pomegranates, litchies, sapotas, plantains and mangoes, the latter principally from Bombay stock. Among those out of season may

be reckoned the pine-apple and pumplenoses ; of the former, there were several baskets. Figs, strawberries, apples and apricots were not forthcoming ; neither were there, as on the last May show, any melons from Caubool stock.

Society's Petition on the subject of the Sugar Duties.

The Secretary mentioned, that the last mail had brought the following reply from the E. I. and China Association to the letter addressed them in January last, accompanying copies of the Society's Petition on the Sugar duty question :—

To JAMES HUME, Esq., Secy. Agri-Horticultural Society of India.

SIR,—I have to acknowledge the receipt of your letter of the 22nd January, accompanied by two copies of a Petition to Parliament (Lords and Commons) on the subject of the Sugar Duties, requesting this Committee to entrust them to such parties as they consider to take the greatest interest in the matter ; I have in consequence to acquaint you, that the one to the Commons was consigned to the care of Mr. J. W. Hogg, who presented it on the evening of the 17th, and that to the Lords has been forwarded to Lord Monteagle. With reference to the difference of opinion among the members of your Society, it would have been satisfactory to this Committee to have been informed of the reasons for their dissent to the Petition*.

I enclose you printed copy of the Sugar Bill, which was read a third time in the House of Commons, and passed on the 18th, with the exception of the 13th clause, which was withdrawn.

I am glad your Petitions arrived so opportunely, and am,

Sir, your obedient servant,

*London : E. I. and China
Association, 19th March, 1845.*

JOHN STIKEMAN.

Vernacular Hand-book of Agriculture, Horticulture, and Farming.

A communication from Mr. H. C. Tucker, to whom, as the offerer of a prize for the best Vernacular hand-book of Agriculture and Horticulture, was referred the *M. S.* on that subject, presented to the Society by Mr. Fenwick—was next read. Mr. Tucker observes, that he has submitted the work for the opinions of good scholars, and gives the result of their's and his own ideas regarding it. He is of opinion that it does Mr. Fenwick great credit, but thinks it would be calculated to be

* The printed copy of the Proceedings of the Special Meeting of the Society will have afforded the required information.

much more useful, were certain alterations and additions which he details, made to it, and a general revision of the work undertaken. To effect the latter object, Mr. Tucker suggests, that one-third of the amount of the prize be placed, in anticipation, at the author's disposal, with the view of his procuring the services of a good moonshee. In the event of the author agreeing to this suggested revisal and improvement of his work, Mr. Tucker offers to purchase 200 copies for distribution in his own district, as well as for the use of the Christian school.

It was agreed, that a copy of this communication be sent to Mr. Fenwick; and, on his agreeing to carry out the suggestions contained therein, a moiety of the sum proposed be immediately placed at his disposal, and the remainder on report of progress being communicated to the Society.

Receipt of a supply of Madder Seed from Europe.

The Secretary drew the attention of members to the resolution passed at the General Meeting in October last, for the obtaining of a supply of Madder Seed from Belgium or France, with the view of giving this useful plant a fair trial in India. The gentleman with whom this recommendation originated had, on that occasion, offered his friendly agency, and he had now the pleasure to submit a late correspondence with Mr. Cowell on the subject, and to intimate the receipt from him, since the last meeting, of a goodly supply of seed, which had been forwarded by the last trip of the *Precursor* steamer. Mr. Cowell observes, that this seed has been procured with great difficulty,—and hence the delay,—from Avignon, through the great kindness of Messrs. Salavy and Co., Bankers of Marseilles, he hopes it will be distributed in the right quarter, as he feels assured that it may be made to form with attention an important article of our exports.

The Secretary submitted a list of members resident at Mussooree, Darjeeling, Nepaul, Tirhoot, Purneah, and various other parts of India, to whom supplies of the seed might be sent with the certainty of knowing that every attention would be paid to the culture of the plant, and the result duly communicated. This list was adopted, and it was agreed, in reference to that portion of the letter from the Secretary to the Government of India to the Society of the 16th Nov. 1842, in which it is stated "that the public frank for the use of any Society shall be confined to special cases in which the Secretary may deem the indulgence to be fairly claimable on public grounds"—that the Secretary of the Society do address the Secretary to Government, soliciting a free transit for this

seed to the parties named in the list (with the exception of those to whom supplies can be sent by the Steamer) the sole object of the Society being to endeavour to introduce into the country a plant which, if successfully cultivated, may be the means of adding another useful article to the list of our commercial products.

It was further proposed by the President, and resolved, that the acknowledgments of the Society be given to Mr. Cowell for the trouble he has taken in procuring this supply of seed, and that he be solicited to tender the best thanks of the Society to Messrs. Salavy and Co., for their disinterested kindness on the occasion.

Mode of cultivating Strawberries and Celery at the Garden of the Lucknow Branch Society.

A long and interesting communication from Capt. G. E. Hollings, Secy. of the Lucknow Branch Society, was next read. After alluding to his success in raising cucumbers from English seed by forcing the seeds in a hot bed, and afterwards planting them out, and intimating his intention of shortly sending to the Society seeds of all kinds of flowers produced in the public garden for distribution to members, Capt. Hollings alludes to the culture of strawberries and celery, and gives an account of the mode adopted in raising them.

Capt. Hollings adds, "I am indebted for these two receipts to Nund Loll Miar, an inhabitant of Mynporee, who is the darogah of our garden, and to whom is to be attributed all the success that has attended the experiments that have been made under my auspices, and if they are considered of any value, it would be gratifying to me to be the medium of communicating to him the expression of the sentiments of the Agri-Horticultural Society regarding them; and although I have done all in my power, by an increase of salary, to show the opinion I entertain of his skill, industry and honesty, I am fully convinced that nothing could tend more to gratify his honorable pride, or stimulate him to future exertions in the good cause of Agri-Horticulture, than the knowledge that his exertions were appreciated by the Parent Society."

At the close of the perusal of the above letter it was resolved, that the thanks of the Society be given to Capt. Hollings for it, and that he be requested to communicate to Nund Loll Miar their sense of his exertions in the cause which the Society is endeavouring to promote.

Cultivation of the Coffee Plant, and introduction of the Walnut-tree and other Cultures in Chota Nagpore.

In the communication forwarding the upland paddy and black stemless date, referred to among the presentations, Col. Ouseley alludes to

the attempts he has been making for introducing the walnut-tree into Chota Nagpore, and the success which has attended his experiments in preserving the sweet-brier and other plants from the attacks of the white ants in the following words:—

“In March 1841, I got 200 English walnuts and sowed them; of these, two grew: one, the white ants destroyed, and the other is a tree seven or eight feet in height, and about as thick as a man’s fore-arm. It is thriving wonderfully. In consequence, when lately in Calcutta, I brought up from thence, seven hundred Cabool walnuts, and am rejoiced to say, that they are *all* coming up. I have sent for more, as the introduction of this tree is very desirable not only for the fruit, but the wood.

“In making a large tank here, I had the earth raised in the centre so as to form an island, about 30 yards in diameter—the water around it is from fifteen to twenty feet in depth. The white ants have all perished—and whatever *slips* are *cut* off and stuck in the soil on the island, grow. Even sweet-brier, of which I have a great number now growing there. This shews that the climate agrees with such plants, which I find *will not* succeed, in the gardens where few slips strike and root, and if they do the white ants never allow them to escape, I mean of the sweet-brier, white provence rose, &c.”

In a letter of a later date, Col. Ouseley mentions that the American sumach is growing beautifully in his garden, and that he is desirous of trying the French madder seed in the government experimental garden, which has been lately formed at Kishenpore (in Chota Nagpore,) principally with the view of cultivating the coffee plant. Col. Ouseley observes, “I do not know whether you are aware that the *finest* coffee produced in India is grown in my own experimental garden. I send you the report* on which the government sanctioned the garden they have up here, and am anxious that people should know that the climate and soil agree so well with the culture of coffee.”

The Esculent Roots of Central Africa.

The paper next submitted was a letter from Dr. Wallich, forwarding a communication to his address from the Rev. Mr. Livingstone, dated Mabotsa, 12th August 1844, in reply to a letter from Dr. Wallich, in which his (Mr. Livingstone’s) assistance was requested on behalf of the Society, in accordance with the resolution of a general meeting held on 8th November 1843, with the view of procuring a supply of the superior sorts of esculent roots which abound in Central Africa. In this

* The Report will be found with the Correspondence in this number.—Eds.

letter the Rev. Mr. Livingstone intimates the steps he has already taken to meet, in part, the wishes of the Society, and hopes that not many months will elapse before he shall be able to announce the despatch of his first assortment to its final destination. He then alludes to his future plan of operations, and gives some interesting details respecting several of the esculents which are to be found in the most dry and sterile situations, and which afford, without cultivation, the chief food of the Bushmen and other natives of the desert.

Resolved,—That the best acknowledgments of the Society be given to Mr. Livingstone for the trouble he has so kindly taken in meeting its wishes, as also to Dr. Wallich for the assistance he has so readily rendered to the Society on the occasion.

The letter of Mr. Livingstone was referred to the Committee of Papers for publication in the Journal.

Nerbudda Wheats.

Extracts of letters were read from Dr. Greig at Seetapore, and Capt. Hollings at Lucknow, regarding the Nerbudda wheats received from Col. Ouseley. Dr. Greig writes—his letter is dated 26th April,—“ Since my last communication, I am sorry to tell you, that the Nerbudda wheats have been entirely destroyed by rust. The produce has not been so much as the seed sown. The plants thrive amazingly well until prostrated by a heavy fall of rain, after which they were attacked by the rust, and the grain blighted. The soil in which they were sown is a deep red loam, which had been previously supplied liberally with vegetable mould in a decayed state. A little powdered oil-cake was sprinkled among the growing plants.”

Capt. Hollings observes, that—“ The rubbee harvest has been a good one, and although the wheat from Hoosungabad seed is not so fine as might have been expected, it has produced a larger and better filled grain than is usually seen here.”

Communications on various subjects.

The following letters and papers were also submitted :

1. From C. K. Robison, Esq., enclosing a list of the timber trees of the province of Malacca, prepared by Mr. Westerhout, Assistant Resident there, at the suggestion of the late Mr. Griffith, and intimating that it will be shortly followed by specimens of all the timbers enumerated in the list.

2. From Dr. Wallich, forwarding, at the request of the author, Mr. Ross, a paper containing hints for plant collectors.

3. From Major T. E. A. Napleton, Secretary of the Bangalore Branch Agri-Horticultural Society, submitting an account of a show of vegetables, fruits, &c., held at that station on 13th April.

4. From Dr. Wallich, furnishing some further documents on the subject of the American sumach, consisting of extract of letter from Captain Budd of Hoonsoor, to Col. Tulloch, Commissary General at Madras, and of another letter to his own address from Mr. Teil at Kidderpore.

With reference to the above letter from Mr. Teil, and to those submitted by Dr. Wallich at the last meeting, it was proposed by the President, and resolved,—that the Secretary do communicate to Dr. Wallich the request of the Society, that he will inform Mr. Teil of the sense they entertain of the service he has rendered to the manufacturing and agricultural interests by his satisfactory trial and report connected with the American sumach produced in the H. C. Botanic Garden.

5. From C. B. Taylor, Esq., annexing extract from the "Library of Entertaining Knowledge," treating of vegetable substances, regarding the *Nerium tinctorium*, which is there stated to produce an indigo of excellent quality, and at much less labor and cost than the indigo produced from the *Indigofera tinctoria*. Mr. Taylor recommends an application for seed of this variety to some of the Society's correspondents in the Carnatic or the Circars, where it grows plentifully, with a view to its general distribution on this side of India.

The Secretary intimated, that on receipt of the above letter he had placed himself in communication with Dr. Wight,—having previously ascertained from Dr. Wallich that he had not any seeds or plants of this tree for distribution from the Botanic Garden,—requesting his assistance in procuring a quantity of seed, and any additional information regarding the tree which he might be able to afford. The seed had lately come to hand through the kindness of Dr. Wight, and was now on the table available to any Members disposed to give it a trial, and he hoped shortly to receive the desired information from that gentleman.

All the above communications were referred to the Committee of Papers.

6. From D. F. McLeod, Esq., intimating that a piece of ground has been selected for a garden, for the Branch Agri-Horticultural Society at Benares, and requesting to be furnished with an assortment of seeds.

The Secretary mentioned, that this request had been complied with as far as the present means of the Society would admit.

7. From Mr. John Cameron, submitting a few beautifully executed drawings of Agricultural implements from Messrs. Slight and Co., Civil and Agricultural Engineers, Edinburgh.

8. From Col. L. R. Stacy, alluding to the circumstance of his having sent to England a quantity of the Butea kino, with the view of ascertaining its value, and to a plan, which he adopted with success, of sending cuttings of plants from one part of the country to another.

9. From P. P. Carter, Esq., of Bojepoor Factory, near Buxar, dated 23rd March, referring to his plantation of Mexican cotton. Mr. Carter states—"You will be sorry to hear, that the produce this year, both in quality and quantity, is far inferior to the last; in fact it is almost a total failure. All the cotton as yet gathered by myself and those to whom I distributed seeds is more or less *soiled, harsh and short in staple*; most of the bolls dropping before coming to maturity, while the plants at the same time appear healthy. I had hopes, that the dry westerly winds setting in in December would have checked the progress of these little red insects, which have proved so destructive to the cotton; but they are now just as, if not more, numerous than ever.

"The destruction of these insects is generally complained of this season, and I witnessed their effects on the cotton grown in the Branch Agricultural and Horticultural Garden at Bauglepore also, exactly as I have found them here: and I see a correspondent in the Society's Journal, writing from Dacca, mentioning the same circumstance. I have tried every means I could think of for destroying, or at least driving them away, but without avail; even smoke appears to have no effect on them. I shall with pleasure send you as much of the Mexican seeds as I have gathered from my crop, which may be about two or three seers, and shall despatch it by an early opportunity per Government Steamer."

In a subsequent letter (April 1st,) when sending the seed alluded to among the presentations, Mr. Carter adds—"You will perceive, that a good many of them have been injured by insects perforating the pods, as I mentioned in my last. I still look forward with great hopes of the hot weather producing a better crop of cotton than I have yet had this year, and of the insects being in some measure dispelled or destroyed, as the plants have been within the last few days throwing out new shoots and blossoms."

The Secretary mentioned, that similar complaints had reached him from correspondents at Rungpore, Gorruckpore, and from the Govern-

ment plantation at Rungpore, where these insects have been attacking the cotton in a most destructive manner. He had received a quantity of the infected pods, which he had transferred to a naturalist, who had kindly promised to examine them, and endeavour, if possible, to suggest some remedy for their ravages.

10. From Dr. W. H. Bradley at Ellichpore, dated March 28, acknowledging the receipt of a quantity of China tea seeds, sent to him by the Society. Dr. Bradley writes, "I have to thank you for the very welcome and unexpected supply of Tea seeds. The period of their arrival gives a very fair opportunity for testing this locality as a *Tea Range* and rest assured I shall not fail to furnish you with my results. I essayed last year, but the seeds forwarded from the Bombay Horticultural Society were bad, and never germinated; those you have been so kind as to send are fresh, and shew every likelihood of doing well. All we want upon these adjoining hills is water, and this desideratum is now about to be supplied by our repairing an ancient tank we found upon the summits, the bund of which had been cut through, purposely some hundred years ago. We expect to retain by our repairs a body of water of nearly a mile in area, and having a depth of about fifteen or twenty feet, more or less. The soil here is wacken beds, having basalt interstratified, a formation not very retentive of moisture, but with the debris of these soft trap rocks, loaded so strongly as they are with iron I sanguinely anticipate success to a tea plantation."

11. From Major T. E. A. Napleton, returning thanks for a supply of American maize, and offering to send a quantity of artichoke, cauliflower, beet, and mignonette seed.

For all the above communications and presentations the thanks of the Society were accorded.

(

C. K. Robison, E

Members Elected.

The gentlemen proposed at the last meeting were duly elected members of the Society, viz:—

Lieutenant C. S. Reynolds, J. H. W. Cox, Esq., Dr. Alexander Duff, and the Hon'ble Mr. Justice Carr.

Candidate for Election.

Lieut. Olpherts of the Artillery, was proposed as a member by Capt. F. C. Burnett, seconded by C. K. Robison, Esq.

Presentations to the Library.

1. The Calcutta Journal of Natural History, No. 21. *Presented by Dr. McClelland.*

2. Report of the London E. I. and China Association for 1844. *Presented by the Association.*

3. The India Journal of Medical and Physical Science, No. 6 of vol. 3. *Presented by Dr. Finch.*

Garden and Museum.

1. A small supply of Egyptian and Taganrog wheats, of white gram from the south of Europe, and of American maize. *Forwarded by the Overland Mail by Dr. Royle, from the India House.*

Dr. Royle observes, that the Taganrog wheat is valuable for its nutritious qualities, from the quantity of gluten it contains, and is moreover well fitted for making macaroni and vermicelli.

2. Seventeen more plants of the stemless palm of Surgooja. *Presented by Col. J. R. Ouseley.*

The Secretary mentioned, that all these plants had reached in good condition, and had been planted out in the nursery.

3. A small quantity of Ceylon tobacco seed, much esteemed by the Singalese. *Presented by John Owen, Esq.*

4. A small supply of an artificial manure. *Presented by T. F. Henley, Esq.*

5. Three skins tanned separately with the American sumach, and with the Babool bark. *Presented by Dr. Wallich.*

Dr. Wallich states, that these skins have been prepared by Mr. Teil, in continuation of his former experiments, which were communicated at the two last meetings of the Society. Dr. Wallich also submits copy of a letter to his address explanatory of these experiments. This letter was referred to the Committee of Papers, for publication in the Journal.

6. A packet of beans. *Presented by A. Scott, Esq.*

The following is the memorandum submitted with the above packet:—

Memorandum.—In January 1844, Capt. F. C. Burnett presented the Society with a little packet of a particular description of bean, which he stated to be a small portion of the produce of one plant raised in

his garden at Dum Dum. The bean from which this one plant was raised was received by Capt. B. with a large assortment of other seeds from Affghanistan, and was the only seed that germinated. On the occasion of presenting this little packet, Capt. Burnett alluded to this single plant as being most prolific, and the produce very palatable.

In October 1844, a few of these seeds were given to Mr. Scott, of Seebpore, who put them immediately in the ground. He states that they germinated very readily, soon produced, and have continued yielding from that period to the present time, and are still (May) full of pods, bearing out most fully the report of Capt. Burnett. Mr. Scott mentions that he has distributed the produce to several parties.

Receipt of the Bust of the Rev. Dr. Carey.

The Secretary stated he had the pleasure to announce to the meeting the receipt, by the *Madagascar*, of the bust of the late Dr. Carey. In consequence of there not being room for it in the Society's present apartment, he had given it temporary accommodation in his own residence, pending the Society's removal into the Metcalfe Hall.

In his letter advising its despatch, received by the last mail, Dr. Royle observes, "I think the bust an admirable one, and which General Macleod immediately recognized as one of your much-esteemed founder. It was done from the picture of Dr. Carey in this country."

An Artificial Manure for the Sugar-cane.

The subject which next came before the meeting had reference to the artificial manure alluded to among the presentations, and which was accompanied with the following letter from the presenter:—

To JAMES HUME, Esq., Honorary Secy. Agricultural Society.

DEAR SIR,—I beg to transmit you herewith a small quantity of artificial manure, compounded in accordance with the modern principles of agriculture, and specially with reference to the cultivation of the sugar-cane.

I would suggest that as the season for experimenting on manures is now approaching, that a comparative experiment be made with the artificial compound, and ordinary cow-dung or farm manure, in the proportion of eight ounces of the compound salt against 15 pounds of ordinary manure, per cane hole, or stool of canes. The object being

not so much to endeavour to surpass ordinary manure, as to find an economical compound which would serve the planter's purposes as a fertilizer, after all his other stores of manures are exhausted, and, moreover, if possible, render permanent his plantations, on the principle laid down by Leibig of restoring annually to the soil an equivalent for the salts we have removed in the preceding crop. The compound now sent contains all the phosphates, silicates and alkalies, with salts of ammonia, such as a silica plant like the sugar-cane demands from the soil for its development, all of which elements are to be had abundantly and cheaply in this country.

A compound similar to that now sent has been employed in Mauritius with the most complete success, having in its fertilizing powers on the sugar-cane exceeded the effects both of guano, stable manure, and vegetable composts.

I would recommend that the artificial manure should be applied at twice, that is, in the proportion of about 4 ounces each time, at an interval of two months, during the rainy season, being well mixed up with the soil for about 18 inches, all around the cane stool. If applied in one spot or *en masse*, it would have an injurious effect on vegetation, from its concentrated nature. It is best applied to young canes of some 18 inches or two feet high. It will also, in all probability, keep away white ants.

I remain, &c.

T. F. HENLEY.

The Secretary was requested to transfer this manure to the garden overseer, with a view to giving effect to the suggestions of Mr. Henley.

Report on Kemaon Pouchong Tea.

The Secretary mentioned that, in accordance with the resolution of the last meeting, he had submitted to the Assam Tea Company the specimen of Kemaon Pouchong tea sent down by Dr. Jameson, and he had been favored with a report from Mr. Rogers, the Honorary Secretary, to the effect that the sample has been well manufactured, the twisting and sorting of the leaves being if anything superior to that of the Assam Pouchong teas. The flavor is stated to be similar to that from Assam, and its strength equal; but the sample has been rather overburnt.

Vegetable and Flower Seeds from England and the Cape.

Letters were submitted from Messrs. Veitch and Son of Exeter, and Messrs. Villet of the Cape, regarding the Society's annual consign-

ment of vegetable and flower seeds. The former state that they have already despatched a consignment, and the latter intimate their intention of doing so at the latter end of April; so that in all probability both despatches will arrive in the early part of July.

Communications on various subjects.

The following letters and papers were also laid before the meeting:—

1. From C. Beadon, Esq., Under Secretary Government of Bengal, forwarding copies of Mr. J. O. Price's cotton reports, from September 1844 to April 1845.

2. From A. L. Harris, Esq., dated London 18th April, giving an account of the mode of cultivating the Cacao, as practised in the West Indies.

3. From Major T. E. A. Napleton, Honorary Secretary of the Bauglepore Branch Agri-Horticultural Society, submitting an account of the fourth and last exhibition of vegetables, fruits, &c., for 1844-45, held at Bauglepore, on 30th May.

4. From P. Homfray, Esq., submitting an account of the successful propagation by seed, of a superior variety of mango.

The Secretary stated that the fruit sent to him by Mr. Homfray was small in size, and very superior in flavor.

The above four communications were referred to the Committee of Papers.

5. From the Secretary of the Kandyan Improvement Society, requesting to be furnished with a supply of different kinds of seed paddy.

The Secretary intimated that previous to carrying this request into effect, he had written for more definite instructions in regard to the quantity, &c. of seed required.

6. From Sir Lawrence Peel, expressing his readiness to meet the request of the Society for plants from his garden.

7. From Messrs. J. Mackey and Co., stating that Messrs. Smith and Campbell of Sydney, have promised to send by the first opportunity, the Van Dieman's Land and New South Wales' wheats, indented for by the Society.

The Secretary having mentioned that he had had several recent applications for Nerbudda wheats and white linseed, it was agreed that Col. Ouseley's assistance be solicited, with a view to the obtaining of small supplies of these seeds from that quarter.

[illegible]

JOURNAL

Agricultural & Horticultural Society

I N D I A

EDITED BY

THE COMMITTEE OF PAPERS.

VOL. IV.

PART II.—JANUARY TO DECEMBER, 1845.

CORRESPONDENCE AND SELECTIONS.

CALCUTTA:

BISHOP'S COLLEGE PRESS.

M.DCCC.XLV.

ERRATUM.

In the Minute of Mr. Willis, at page 13 of *Correspondence and Selections*, seventh line from top, for, "There is an illusion in the measure, which will lead those also made on its base towards destruction,"—*read*, "will lead those who move on its base," &c.

Contents

OF PART II, VOL. IV.

No. 1.

	<i>Page.</i>
ART. 1.—Correspondence and minutes connected with the Society's Petition to Parliament for a general reduction of duties on colonial and free labor foreign sugars, ...	1
2.—A list of Woods indigenous to Arracan. Communicated by Lieut. W. F. Nuthall, 18th Bengal N. I., ...	13
3.—Report on Samples of Cotton, grown from foreign seed in the garden of the Branch Agri-Horticultural Society of Bhaugleapore;—at the Government Cotton farm at Gor- ruckpore;—and at Bojepore Factory, near Buxar, ...	20
4.—Memoranda accompanying a sample of farinaceous pow- der prepared from the roots of the <i>Tacca pinnatifida</i> , abounding in certain parts of the province of Arracan. By Major D. Williams, ...	24
5.—Notice regarding the American Sumach, with a recom- mendation for its culture in India. By N. Wallich, Esq., M.D., ...	26
6.—Comparative return in Liquor and Goor, from certain descriptions of Sugar cane, ...	27
7.—Effect of Galvanism in promoting the growth of Potatoes. Communicated by W. Haworth, Esq., ...	28
8.—Mode of preserving grain from the ravages of the Weevil, ...	29
9.—Introduction of American Maize in Ajmeer and Mhair- warra, ...	31
10.—Report on the Garden of the Branch Agri-Horticultural Society of Cuttack; with an account of Exhibitions of Vegetables held at that Station. Communicated by Capt. W. W. Dunlop, Secretary of the Society, ...	32
11.—An account of the First Horti-Floricultural Exhibition of the Lucknow Branch Society. Communicated by Capt. G. E. Hollings, Secretary of the Society, ...	35
12.—Horti-Floricultural Exhibition of the Bhaugleapore Branch Society. Communicated by Major T. E. A. Napleton, Secretary of the Society, ...	38
13.—American Sumach, ...	41
14.—Directions for cultivating Madder, ...	45

No. 2.

ART. 1.—Correspondence relative to the valuable properties of the American Sumach, or Dividivi, (<i>Cæsalpinia coriaria</i>) as a tanning plant. Communicated by Dr. Wallich, ...	65
2.—Correspondence connected with the formation of a Go- vernment Experimental garden at Kishenpore, in Chota Nagpore, for the cultivation of Coffee,	76
3.—A few particulars regarding some of the Esculent Roots and Fruits of Central Africa. Communicated by the Rev. David Livingstone,	78
4.—A List of the Timber trees of the Province of Malacca. By J. W. Westerhout, Esq., Assistant Resident. Com- municated by C. K. Robison, Esq.,	80
5.—Notice of Horticultural operations in the Garden of the Branch Agri-Horticultural Society at Lucknow. Com- municated by Captain G. E. Hollings, Secretary of the Society,	82
6.—Remarks on the applicability of the Nerium (<i>Wrightea</i>) tinctorium for the manufacture of Indigo,	86
7.—An account of the successful propagation by seed of a superior variety of Mango. Communicated by P. Hom- fray, Esq.,	89
8.—A mode of conveying cuttings of plants from one part of the country to another,	90
9.—An account of the first, third, and fourth exhibitions of Vegetables, Fruits, &c. held during the season 1844-45, by the Branch Agri-Horti. and Floricultural Society of Bhaugleapore,	1b.
10.—The Agriculture of different ages and countries,	102
11.—Electricity of Plants, and influence of Electricity on Ve- getation,	125

	Page.
	127
	128
Society for April, May and June, ...	xxi
Meteorological Register, for April and May, ...	xliii-iv

No. 3.

ART. 1.—Further particulars regarding the Nerium Indigo, ...	129
2.—Successful cultivation of the China Sugar cane at Buxar and Dhoba,	131
3.—Account of an exhibition of Vegetables, Fruits, &c. held at Lucknow in June, 1845,	133
4.—Experiments on the growth of Indigo, under various modes of treatment. Communicated by W. Haworth, Esq.,	135
5.—Progress of Silk culture at Bangalore, with a few remarks on the vegetable products of that station. Communicated by Dr. F. J. Mouat,	137
6.—Experiments with Guano on Garden produce,	140
7.—Account of a 3 years' bearing Mango tree of Arracan,	141
8.—Result of an Experiment to introduce American Cotton into the District of Shahabad,	142
9.—Result of trials given to various seeds in the District of Champaran. Communicated by J. W. Yule, Esq.,	143
10.—Award of prizes by the Agricultural Society of Madras, for samples of Raw Silk. Communicated by Capt. F. S. Gabb, (52nd Madras, N. I.) Secretary of the Society,	146
11.—Suggestion for importing Melon and Onion Seed from Egypt,	148
12.—The Productions of Egypt,	149
13.—On the production of Soils and Manures by the lower orders of Plants,	161
14.—Theory of Bone manure,	172
15.—Horti-Floricultural Notes,	178
16.—On the Rotation of Crops, and on the quantity of Inorganic matters abstracted from the Soil by various plants under different circumstances,	193
17.—Transmission of Cuttings to India,	197
18.—Proceedings of the Society for July, August, and Sept.,	xlv
19.—Meteorological Register, for June, July, and Aug.,	lxv-vi-vii

	<i>Page.</i>
ART. 1.—Note on the Kang Punneah Naga Tribe. By J. M'Clelland, Esq.,	199
2.—Result of Experiments with Guano on Flowers. By R. Smith, Esq.,	202
3.—Recipe for the preparation of the Salep Misree root. By Captain J. C. Brooke,	205
4.—Further Experiments with the Shan Black Vegetable Dye, &c. Communicated by the Society of Arts, ... ..	... <i>Ibid.</i>
5.—Correspondence regarding the cultivation of Madder in the Deccan, with hints on a mode of curing Senna,	207
6.—Capabilities of the climate and natural features of the Palamow District for the rearing of Sheep. Communicated by C. B. Taylor, Esq.,	210
7.—Remarks on a few kinds of Edible Oils, and on the Butea Kino of the Palamow Jungles. By C. B. Taylor, Esq.,	211
8.—Progress of the Branch Agri-Horticultural Society of Bhaugulpore,	215
9.—Memorandum of the result of an Experiment in crossing the Indigenous Cottons of India. By Dr. A. Burn, Superintendent Government Cotton Experiments at Broach,	219
10.—On "Gutta Percha," a peculiar variety of Caoutchouc. By Douglas MacLagan, M.D. F.R.S.E., &c. Communicated by the Royal Scottish Society of Arts,	221
11.—Brief Observations on some of the Pines and other Coniferous Trees of the Northern Himalaya. By Captain Edward Madden, Bengal Artillery,	223
12.—Proceedings of the Society for Nov. and Dec.	lxix
13.—Report of the Agricultural and Horticultural Society of	lxxxvi
| Disbursements of the Agricultural Society of India, from 1st January, 1845,	c
| for Sept. Oct. and Nov.	civ-v-vi
16.—List of Members of the Agricultural and Horticultural Society of India, 31st December, 1845.	

I N D E X

TO PART II, VOL. IV.

	<i>Page.</i>
Agri-Horticultural Society of Cuttack. Report on the Garden of the,	32
— Lucknow. Account of Exhibition of	
fruits and flowers of the, ...	...35, 133
— Notice of operations in the	
Garden of the, ...	... 82
— Bauglepore. Exhibition of fruits, flowers,	
&c., ...	... 38, 90
— General Meeting of the, ...	215
— Madras. Award of Prizes for Silk spe-	
cimens, ...	... 146
Agriculture (Indian.) Notes on, as practised in the Western or Bom-	
bay Provinces of India. By Dr. Alexander Gibson, ...	46
— of different ages and countries. By C. W. Johnson, ...	102
Bone manure, theory of, ...	172
Cotton Samples grown from foreign seed in the garden of the Branch	
Agri-Horticultural Society at Bauglepore ;—at the Government farm	
at Gorruckpore ;—and at Bojepore Factory, near Buxar. Report	
on, ...	20
—, result of an experiment to introduce American varieties into	
the District of Shahabad, ...	142
—, result of an experiment in crossing the indigenous varieties, ...	219
Coffee cultivation at Kishenpore in Chota Nagpore. Communicated	
by Colonel Ouseley, ...	76
Crops, on the rotation of, ...	193
Cuttings, transmission of to India, ...	197
Dye (Shan black vegetable), further experiments with the, ...	205
Electricity, influence of, on vegetation, ...	125
Egypt, the productions of, ...	149
Galvanism, effect of, in promoting the growth of Potatoes. By W.	
Haworth, Esq., ...	28
Guano, experiments with, on Garden produce. By F. W. Russell,	
Esq., ...	140
—, on flowers. By R. Smith, Esq. ...	202
Gutta Percha, experiments with, ...	221
Horti-Floricultural notes, ...	178

	<i>Page.</i>
Indigo, experiments on the growth of, under various modes of treatment. By W. Haworth, Esq.,	135
Maize (American,) Introduction of in Ajmeer and Mhairwarra. By Major Dixon,	31
Madder, directions for cultivating,	45
———, notices regarding,	57
———, culture in the Deccan,	207
Mango from seed. Successful propagation of,	89
Mango trees of Arracan, account of three years' bearing,	141
Nerium Indigo. Notices regarding,	86, 129
Naga (Kang Punneah) Tribe. Note on the, By J. McClelland, Esq.,	199
Oils (Edible) from the Palamow district,	211
Pines and other Coniferous trees of the Northern Himalaya. Brief Observations on,	223
Roots and Fruits of Central Africa. A few particulars regarding the, By the Rev. David Livingstone,	78
Sugar (Duties) on colonial and free labor. Correspondence and minutes connected with the Society's petition to parliament for a general reduction of,	1
Sugar cane. Comparative return in liquor and Goor from certain descriptions of. By F. Nicol, Esq.,	27
——— (China) successful culture of, at Buxar,	131
Sumach (American) or Dividivi, notice regarding the, 26, 41, 65	65
Silk culture at Bangalore, progress of,	137
Soils and manures by the lower order of plants, on the production of,	161
Salep Misree root, recipe for the preparation of,	205
Sheep-rearing in the Palamow district,	210
Tacca pinnatifida plants. Memorandum accompanying a sample of farinaceous powder prepared from the roots of, By Major D. Williams,	24
Timber trees of Malacca. List of the,	80
Woods Indigenous to Arracan. A list of, By Lieut. W. F. Nuthall, .	13
Weevil, mode of preserving grain from the ravages of,	29

Correspondence and Selections.

CORRESPONDENCE AND MINUTES CONNECTED WITH THE SOCIETY'S
PETITION TO PARLIAMENT FOR A GENERAL REDUCTION OF DUTIES
ON COLONIAL AND FREE LABOR FOREIGN SUGARS.

To J. HUME, Esq. *Honorary Secretary Agri-Horticultural Society.*

MY DEAR SIR,—I beg leave to submit whether, at this great juncture, some prominent steps should not be taken by the Agri-cultural Society, for the purpose of representing, as truly and as clearly as the matter can be put, the interests of India *in re* sugar. I call the juncture great, not because I would attempt to deceive some by assuming an importance which the question itself does not bear, but because it is intimately connected with the prosperity of India; because, though now at a stand, India, within a few years, increased the produce of sugar to an extent which justified, if it did not exceed, the most sanguine anticipations; because in the course of seven years the supply from India to England increased forty fold; because India now furnishes a fourth of the annual home consumption; and because it has just been announced in Parliament, that the consideration of the sugar duties, with a view to their final settlement, shall remain in abeyance only for about eight months longer. There is nothing by which the production and consumption of colonial produce is so much affected as the rates of customs duties; the emancipation of colonial stains which happened once, and cannot happen again, need not be considered an exception; and I would repeat, for the history of the point is recent enough to be easily ascertained, that the vital and lively success or the drooping failure or stagnancy of colonial agriculture and commerce, is mainly affected by the customs duties at which colonial produce is admitted into the home market. The fittest adjustment, and, if need be, a reduction of these duties, is the only assistance,

external to themselves, which East Indian planters can seek to improve the sugar market: the best mode of cultivation and manufacture, they are at all times free to choose; what they reject to-day they may adopt to-morrow: but in a matter which they cannot control, they have only a few months to deliberate, and deliberating, to determine if they have any information to tender to Sir Robert Peel, which, sometime next March or April, might induce him so to modify his new financial scheme as to secure benefits to India, which, without the information thus tendered, would have been lost. Single efforts will scarcely suffice; and it seems to me that the facts which cannot but be available may very properly be digested by, and submitted through, a Society of standing and reputation. Surely India cannot have produced 1,200,000 cwt. of sugar for successive years without supplying facts, known to many, by which the cost of production, and the average of a remunerating price may be illustrated. To produce cheap, and sell dear is the only problem which the planter has to solve; and by this time, as I have said, having already exported 1,200,000 cwt. in a year, he should know something of his charges and his profits.

It seems at this time quite unnecessary to speculate upon, or provide for any other measures than those which are likely to be submitted by the present Government in England. If it were doubtful that the next year's Tariff should be promulgated by Sir Robert Peel or by Lord John Russell, the preliminary proceedings of parties interested in the extension of the export of Bengal sugar would have to be differently shaped; they would then have to consider not only what rate of customs duty, as affecting themselves, is compatible with a remunerating price (which I take to be their foremost question now) but what arguments they could offer, why *all Foreign* sugar should not be admitted on the same terms as their own. But from the relative strength of the Parliamentary parties there is no probability, scarcely a possibility, of differential duties being absolutely abandoned, and on the contrary, we have an assurance clearly foreshadowing the result, that protection will be continued to the colonies of Great Britain.

Could any thing that we have to say, be said without using the word Protection at all? Far before the abstract question of protec-

tion, and its interests and duties, personal, national or cosmopolitan, is the question of profit and loss, of cost and price. Freedom in trade, is not necessarily the antagonist of profit. A colonial trade may very possibly be profitable, even when a foreign trade is free, much more if, as in our case, the foreigner must pay a bonus for his admission into our markets. And fully am I satisfied, that looking to the outlay which the production of sugar has cost him, and the prices which its sale has yielded and continues to yield, it far more concerns the planter to endeavour to lighten the burdens which now encompass his speculation with uncertainty and risk, rather than to trace his own losses to the non-prohibition of foreign competition. Let him produce cheaply to those who consume freely : and considering the standing he has already acquired, he may safely postpone foreign restriction to free consumption. I do not like, for example, the mode in which the protection argument seems to have been put by Mr. Mangles, judging from his shortly reported speech. It would have been more satisfactory had he spoken rather of low profits than the outlay which the use of expensive machinery had entailed. To my mind, Mr. James was more practical, who fighting the West India interest at home, while his son managed abroad, declared that every pound he sold at $6\frac{1}{4}d.$ cost him $7d.$ Quite right was Mr. James to seek something more than $6\frac{1}{4}$ for his $7d.$; so should the East India Colonist seek an adequate profit upon every hundred weight he produces ; and with that end let him curtail every cost that intervenes between the jointing of his seed canes and the purchases of consumers ; and first let him attempt to curtail an expence which is not an essential element in the production of his sugar, the duties levied to make him free of the Custom House. Does the planter doubt if this would benefit him ? does he think, following the text book of a Political economist, that this tax is paid always, and only, by the consumer, not injuring the producer ? Let him calculate the effect of throwing open the consumption of a fixed quantity of his sugar to a million and a half instead of one million of people ! Only one million can afford to purchase the offered sugar when the price is enhanced with a duty of 24 shillings ; but the duty being reduced to 16 shillings, and 8 shillings in the shape of duty being struck off the price, the

commodity which was before open to 1,000,000 is now open to 1,500,000. Then the effect is inevitable. The planter would have been remunerated as much as before, by selling his sugar less the 8 shilling duty, but now the competition of consumers adds 4 shillings to what under the circumstances would have been the market price, and all this is so much gain to the planter's profits.

Next session of Parliament the Sugar duties will certainly be reduced. Sir Robert Peel spoke the other day hypothetically of a reduction of 8 shillings. Now the subject of investigation which, with my merely speculative opinions, I would urge upon the practical wisdom of the Society is, whether or not, it concerns the interests of India to secure a reduction of 8 shillings, or a reduction of 12 shillings, or a reduction of 16 shillings; surely some facts are to be gotten out of the experience of the last 7 or 8 years, some facts producible in India, and not producible in England, which would help a wise and prudent minister to an issue distinguishing justly between eight and sixteen. Not possessing the facts which India alone can give him, facts shewing the circumstances under which sugar planting is impeded, shewing the exact relations which of late years prices have borne to charges, shewing (as I presume may be shewn) how from the uncertainty and insufficiency of the returns, the production of sugar, after so striking a development, is now stagnant, the minister will naturally frame his measure more with reference to the wants of the consumer and to the conditions which he may conceive to be best applicable to his financial operation, irrespective of the necessity which exists, (though it may not have been explained to him) of promoting not indirectly as a consequence of following other good ends, but directly on its own account, the production of sugar in India. It should never be forgotten, that every sixpence, every shilling gained in deduction of duty is a boon to the planter. Supposing Sir Robert Peel ready of himself to offer a reduction of 8 shillings; if an appeal from India should induce him to extend his proposition to 10 shillings, it will be an extension wholly in the right direction. Relax restriction, and you widen the range of competition; block up the gates of your ports, and you throw so much sugar back on the planters' hands. It may be seen in Mr. Porter's "*Progress of the Nation*," that the consump-

tion of sugar per head in England was twice as much in 1801 as in 1840: in 1801 being 30lb; in 1840, 15lb. Probably during the last year or two it has been 19 or 20lb: there is just as much disposition to consume now as in 1801. Then the duty was 20 shillings. I do not say that a return to the same duty now would raise the consumption 50 per cent; but with reduced duty there springs an aptitude to consume, which certainly would raise the effective demand to that extent: and the continually increasing population opens, day after day, new channels of consumption.

I now leave these remarks in your hands; you are in a much better position than I am to determine if something or nothing should be done in the matter. Shall we help ourselves, or shall we take the chances as they come, measured to us with various fates by the adoption of a series of Parliamentary resolutions?

I am, &c.

A. SCOTCH.

Chittagong, 3d Sept. 1844.

Minutes of the Members of the Special Committee appointed to take the foregoing letter into consideration.

I think we should be represented at home, during the discussion of this important question; but I should like to meet, and exchange a few ideas with my Committee-men, before deciding as to the best way of proceeding.

I do not know what facts we could bring forward to influence the decision of the question. There is an evident leaning at home now to quiet the millions, by giving them, not only cheap sugar, but all things cheap. Should we make out that we cannot without loss sell our sugar much under present prices, we may be told that others can.

Should we, on the other hand, make out that we can supply sugar at very cheap prices, the argument may again be turned against us, and we may be told that we want but a very small protective difference of duty.

All countries would be advantageously interested in the *lowering* of the duties, but our main advantage will be, in the *difference* of duty which we are to pay.

There are three modes now in this country, in which the sugar exported to England is prepared.

1st. The old native method, (by which the bulk of the sugar exported has been manufactured,) which I suppose is precisely now what it was years ago, and will be for years to come.

From all the information I have heard, I believe that from 8 to 9 rupees per maund for the average of white sugar is required to pay those employed in its production; and that when the price approaches 7, the sugar lands fall out of cultivation.

I do not think we can found any thing upon this stationary process.

2nd. The method lately commenced of bringing European machinery and skill to operate upon the raw material, by which perhaps, one half of the losses of the native method are saved; the other half consisting of the cultivation and the expression and reduction of the juice is left untouched.

3rd. The conduct of the whole process, from the sowing of the cane to the making of the sugar, which I conceive is in time destined to supersede the other two, and to give us sugar as cheaply as it can be produced in this country.

I think perhaps our argument should be,—that many parties have engaged in the pursuit, under existing circumstances, and that any sudden change which should very much lower the prices of sugar, would paralyze their efforts, which if encouraged, will ultimately tend both to the advantage of this country and Great Britain.

8th November, 1844.

J. COWIE.

I agree generally with the suggestions and opinions of Mr. Cowie, but I think we should base our petition for a greater protection or differential duty, than has been allowed us, on other grounds. It is quite impossible to form here any accurate notion as to the real cost of production of sugar in those countries whose produce, (free grown,) is about to be admitted to home consumption; but, judging from the prices at which, for a series of years, Javas and Manillas are sold in the English markets, say in 'Bond, good whites, (*clayed*), at 22s. 6d. to 24s.—strong greys at 21s. to 22s.—yellows at 18s, and

low browns at 13s. to 14s. 6d. per cwt., I am of opinion that the Act lately passed for admitting these sugars at 34s. duty only, will most seriously affect us in this country for some years, and deprive us, in a great measure, of one of the best and safest mediums for the remittance of all dues home, (already a difficult matter from the want or inadequacy of exportable commodities,) apart from other considerations which refer to the prosperity of the country, and the increase of its resources. Doubtless European skill and machinery, with an improved system of cultivating the cane, such as our western colonies adopt, will effect a great change here; and my opinion is, that *eventually*, we shall succeed in producing as good and cheap sugar as any other country where labour is not compulsory; but this must be a work of time and progression. We have advanced but slowly during the last 5 years in production, even with the advantage of protection; and now that this is to be withdrawn from us, I apprehend that the cultivation on the part of natives will retrograde, and much land be thrown out of use. Under these circumstances, I think it is the duty of the Agricultural Society, and also of the Chamber of Commerce,—an imperative one—to petition the legislature for a *reduction* of duty on our *colonial* produce, say to 18 or 20 shillings, (as the free trade notions in vogue forbid all idea of *increasing* that of *foreign*,) and I shall be happy to render any assistance in my power in furthering the views conveyed in Mr. Sconce's letter.

8th November, 1844.

J. COWELL.

With Mr. Cowie, I think we ought to be represented at home during the forthcoming discussion upon this most important matter, as we are led to believe it is to be the final settlement of the sugar duties question. It would be well to have a meeting of the Committee as early as convenient, to consult together as to the proper course to be followed.

I am of opinion, that but few sound reasons could be brought forward for the continuance of a *heavy* protecting duty in favor of our colonies, nor do I think it necessary for their prosperity; and after taking into account the enormous sum granted for emancipation, I think we should also have difficulty in finding sound ar-

guments against the admission of free grown sugar from foreign states at a *fair* discriminating duty. Still I think every possible means should be taken to prevent the admission of Slave-grown. I consider it is of the utmost importance to all interested in the production of sugar in this country, that the question of duties should be permanently settled for years, or there will be no inducement for capitalists to invest in expensive machinery and necessary works. If once settled, I am inclined to think, that a protecting duty of even 8s. or 10s. will be found quite sufficient, especially if legislators could be prevailed upon to lower the sugar duties to something like 15s. or 16s. (which most probably will soon be the case,) on colonial, and in the same proportion on foreign free grown. This no doubt would cause a great increase in the consumption of the article. The effect of the present new duties, will be to raise the price of free foreign qualities, until such countries have increased their production to such an extent as to cause prices to fall from over-supply. It is but natural to suppose, from the fact of there being very small stocks of sugar held in all the important marts in Europe, that no more has been produced than is just equivalent to the present consumption at the current rates, and I would submit, that some years must elapse before there could be any great reduction of price on the home market from over supply, *especially* if, in the mean time, consumption had increased in proportion to such a reduction of duties as I have before named, and which we may look for.

I believe Rs. 8. in this market, would bring as large a quantity of fine white sugar as is now received, after a lapse of two or three years, which would be required to recover from the check such a sudden fall in prices would cause. Sometime would also be required to equalise the interests of the landowner and ryut—the former would have to come down by degrees to the old rate of fees or rent for sugar land, which I have reason to believe has increased, in proportion to the advance in the price of sugar in this market, and in most instances I believe the landowner, and not the ryut, has been the gainer from high prices.

I knew from a considerable amount of information, which I have partly collected myself, that very good sugar, now worth from

Rs. 9 to 11-8 in Calcutta, can be produced by the natives in some districts at 5-8 to 8, and at these rates leave them a fair profit, and in such districts the increase in the production is yearly progressing, and can go on to a very great extent even around Calcutta, where the rent for land is very high; first rate Khaur, which can be shipped as Muscavado sugar, and which sold last season from 6 to 7 per maund, can be produced at 4-8 to 5, and leave to the grower a fair remunerating return.

Mr. Cowell remarks, "that this country has advanced but slowly during the last five years in the production of sugar, even with the advantage of protection, and now that this protection is to be partially withdrawn, he fears we shall retrograde."

I am of opinion that the slow progress made may be attributed more to the continual agitation, and the great uncertainty as to the extent and nature of such alterations, as our Government might think fit to make in the duties, when the question was left from year to year for further discussion, during each of the five years he names; which has tended more to prevent a large amount of capital and skill from being employed, than in lessening the original amount of cultivation, which I believe has remained pretty nearly the same; but the produce has been diverted into other channels, and a much larger amount has been consumed in the country in consequence of lower rates.

I would therefore base any petition to Parliament upon the ground that the late alteration in duties is on the whole an equitable one both to the colonies and the great mass of consumers, and pray for a general and liberal reduction in the duties on colonial and free labor sugar, keeping the protection in favor of our own colonies proportionately as much as by the late alteration; but above all I would petition for such a permanent settlement of the question, as to enable men of capital and skill, to invest their money with confidence of being allowed a fair opportunity to realize a remunerating return.

Under such arrangements, I should consider the interests of this country sufficiently protected; and I do not hesitate to predict that we should see India gradually, but surely, taking her place amongst

the foremost upon the list of sugar-producing countries both as regards quantity and cheapness.

I shall be happy to render all assistance in my power to forward any measure which may be proposed likely to be of service to the country, and in furthering the views of Mr. Sconce, as detailed in his letter to the Honorary Secretary.

14th November, 1844.

WM. HAWORTH.

My colleagues have written so fully on this question, that but little is left to be added. There can be no doubt, that India possesses great advantages as a sugar-producing country, and that year after year, her vast resources are being developed from the enterprise and skill, brought here by those who seek the cultivation of the "Rupee tree," under its various forms. A reduction of duties may be, I think, confidently anticipated, from the disposition now so general, not only to supply cheap food, but also to encourage free trade, for it is well known that the consumer pays the duties, and that the price of an article controls the demand.

26th November, 1844.

CHARLES HUFFNAGLE.

I am decidedly of opinion that the Agricultural Society ought to petition Parliament, this Government and the Court of Directors, on the subject of the sugar duties, which there is every reason to suppose, will be permanently settled in the ensuing session.

Looking to the strongly expressed opinions of all the great political parties at home, and to the general tone of public feeling, I

ec-

For a continuance of the differential duty of 10*s.* between British Colonial and other Free labour sugar.

For a lowering of the scale of duty, say from 24*s.* and 34*s.* to 14*s.* and 24*s.*, so that the consumption may be extended to meet the increased supply; which we may safely assert, will be forthcoming

from the free labour countries, and we hope from our own Colonies ; and finally,

For some assurance, that no change will again immediately take place, and that the adjustment may be permanent for a certain period.

I assume it to be admitted that any measure that would raise the cost of sugars to the British consumers more than 10 per cent, *in bond*, beyond what the foreign continental consumer pays, would not for a moment be listened to, and that even that protection, or tax, would not be submitted to, unless there was some prospect of its reduction by our being able to supply cheaper sugar.

On this point, I beg to say, that from long enquiry and much investigation, I am decidedly of opinion that white sugar produced by natives, cannot be afforded for export, under 8 and 9 Rs. per maund. At any thing, under that, land goes out of cultivation, and the native consumption, especially to the westward, is enormous, leaving comparatively little for export. Out of the price for white sugar, but a small portion goes to the cultivator of the cane in the Benares Provinces. He almost never sells the sugar in its prepared state, but it almost all passes through the hands of a class of refiners and Mahajuns, and they derive the greatest share of the profit from an increased price in the market, this no doubt also proceeds occasionally, by competition among themselves to pay higher prices for the raw material.

In the lower provinces, the European refineries have taken the place of the class of sugar boilers above referred to ; and being able to give higher prices for the raw material, have tended much to increase the cultivation of the cane in Bengal ; but it is only from cane cultivated by Europeans, and manufactured by European machinery, that we can hope to supply sugar at prices which will enable India to compete with the produce of other countries.

We have not succeeded hitherto, for out of an annual export of 60,000 tons, *not* 600 (I believe *not* 60 tons) are the produce of cane cultivated by Europeans, and *produced at a profit* ; but we may ask for protection for a few years at any rate ; because great efforts are being made, and large capitals in course of expenditure, for the purpose ; and a few years encouragement will prove what can be

which are particularly worthy of notice, and could be advantageously made an article of export. Arracan is a remarkably rich and productive forest country, and is I imagine, better situated with regard to facility of timber transport to Calcutta, than any other locality within the same distance. It is fair therefore to infer, that this will eventually become an object of primary importance to the settler, and that any information which can at present be thrown upon the subject will prove interesting to many of the members of the Agri-Horticultural Society, and even to some a valuable reference. Under this impression, I have been induced to draw up a scale (from the most authentic sources) of the prices at which timbers of the largest dimensions are procurable at the Ghaut, for shipping. It will be observed that many of the rates are high, but I have assumed the highest, in order that no disappointment may be subsequently experienced ; at the same time I would hold out every prospect of a material decrease upon its becoming an article of more general traffic, as the Mug is peculiarly active with the use of his "Dhow," and many of the more indigent, who are chiefly dependent upon their own manual exertions for subsistence, would gladly betake themselves to a profitable occupation requiring no other call upon them beyond the union of a few. To obtain woods of a superior quality however, it would be essential to detach with them an experienced Native Overseer, in order that the trees might be barked in the spring, and felled when most free from extraneous vegetation.

I have also the pleasure to forward to the Society half a maund of *gurjun* oil, a vegetable matter which issues from tree specimens, No. 85. The Mugs extract it by cutting a cell in the trunk, and placing a fire inside for a short time ; an emission then ensues, which discharges itself by a cut at the bottom of the cell into an earthen vessel hung outside. This oil is a great preservative to wood as a varnish, and is an excellent drier in composition with paint, possessing in this respect, when prepared by boiling and clearing off the scum, the properties of turpentine. That which I forward should be distributed amongst those who desire to try it, as it is an article which, when more generally known by Civil Engineers, Builders and others, would consi-

derably supersede the use of both turpentine and varnish, its price being so much less, and quantity so abundant. Many thousand maunds could be procured upon a demand, and the highest price would be about 3 rupees per maund.*

With reference to the mulberry slips, maize and cotton seeds with which you kindly supplied me, I am happy to inform you that I have been successful with all three. From the promising appearance of the slips, I anticipate that next cold weather they will supply sufficient food for as many worms as I shall require at

* The oil here alluded to by Lieut. Nuthall is yielded by several species of the genus *Dipterocarpus*, which abound in many of the eastern parts of India, as well as in Burmah, and the Malay Islands. The mode of extracting the liquid, as given by Lieut. Nuthall, is much the same as that mentioned by Roxburgh, (*Flora Indica*, vol. 2, p. 613,) who moreover states, that the average produce of the best trees of *D. turbinatus*, during a season, that is, from November to February, is as much as forty gallons; but that the largest proportion of the best sort of oil is obtained from *D. incanus*. This oil, or balsam, is well known in all the Indian bazars, and is used for painting purposes of the coarsest description, in godowns and other places where cheap work is sought for rather than good work. Its price, at the present time, ranges from 5 to 7 rupees per bazar maund, which, taking into account the charge for freight and several other contingencies, appears to be too low a rate to admit of this product of Arracan being profitably imported into the Calcutta market. The *Gurjun tale* has been made the subject of various experiments by Dr. O'Shaughnessy, (Vide *Bengal Dispensary*, pp. 222 to 224.) By distillation he found it to yield a volatile oil identical in chemical composition with that of the balsam of copaiba, and it has been accordingly extensively used in the hospitals of this city, with exactly the same medicinal effects. The difference of cost between the two,—the essential oil of *gurjun*, being about one-tenth the price of the balsam of copaiba,—is another great point in favor of the substitution of the former for the latter, not only in medicine, but also in the arts, in many of which copaiba is now used. In addition to the above, it is known to be a good solvent to caoutchouc. Its application to this purpose was first brought to the notice of the Society by a member, Mr. Laidlay, whose communication is published in the *Transactions of the Society*, vol. viii, p. 345. This oil has never, we believe, become an article of external commerce, though in consequence of a communication from Dr. Royle, about five years ago, stating that it was much required in England for experiment by manufacturers, and that it might become an article of commerce if made known there, a member of the Society was induced to transmit about five hundred gallons of it as a speculation. We learn from Dr. Royle. (v. "Productive Resources of India," p. 77,) that the attempt failed from the circumstance of the Custom House Officers having refused to pass it except at the highest rate of duty, namely that for a manufactured article. "The selling price," as he justly observes, "is hence increased, before it is even known, and it may thus perhaps be prevented from becoming an article of commerce."—EDS.

starting. The little of the maize seed I sowed, has come up very strong, although it is not the proper season for it. Of the New Orleans cotton seed, only four have germinated, but they bear such a healthy appearance, as to justify the probability of cotton cultivation answering here. I am aware of large quantities of cotton seed having been tried in Arracan, and I am not acquainted with a single previous instance of its having thrived, this however is to be attributed to the seed (most of which has come under my own inspection) having been mildewed and rotten. I particularly examined that under consideration, and am very pleased at having succeeded with four out of the whole.

Akyab, January 4th, 1845.

List of Woods indigenous to Arracan, forwarded together with specimens to the Agri-Horticultural Society of India, by Lieut. W. F. NUTHALL, 18th Bengal Native Infantry.

- | | |
|--------------------|----------------------|
| 1 Myonk-lók, | 21 Hna-goung-bú, |
| 2 Myonk-goung, | 22 Gran, |
| 3 Kan-gan, | 23 Kyók, |
| 4 Hma-yan, | 24 Kiun-lan, |
| 5 Da-bru, | 25 Hman-kyè, |
| 6 Tong-ran-khot, | 26 Praing, |
| 7 Kro-thá, | 27 Hra, |
| 8 Swun-khri, | 28 Sék-khí, |
| 9 Thit-pók, | 29 Saing-théng, |
| 10 Toung-prá-non, | 30 Bók-thá, |
| 11 Thit-non, | 31 Rí-than-bon, |
| 12 Shon-tha-rát, | 32 Pré-wá, |
| 13 Ta-lé, | 33 Pan-khá, |
| 14 Hman-doung-krí, | 34 Kyè, |
| 15 Hma-doung-nge, | 35 S'a-tú, |
| 16 Pouk-pan, | 36 Mran-khyí-shá, |
| 17 Ta-ruá, | 37 Pré-tha, |
| 18 Praing-han, | 38 Tan-pa-dá-gá, |
| 19 Krat-moung, | 39 Nwá-laing-byaing, |
| 20 Thit-mwan, | 40 Khrat-ró, |

41 Ri-p ^h ra-non,	71 Thit-sa-gá,
42 Son-thá,	72 U-hué,
43 Ngóng-hrevi,	73 Hnon-bé
44 Tok-thá,	74 Khroung-khí,
45 Tha-páik,	75 Saing-laing-khá,
46 Lon-paik,	76 Lat-pon,
47 Tha-bri,	77 Ouk-khan-zá,
48 Tri-gon,	78 Tha-dwát,
49 Pa-douk,	79 Ka-thit,
50 Thit-nat,	80 Shí-shá,
51 Tha-rat,	81 Prong-pa-zá,
52 Than-gou-nat,	82 Ra-ma-ni,
53 Ong-dóng,	83 Pi-nè,
54 San-wé,	84 Mrát-swá,
55 Tha-wan,	85 Kon-gyau,
56 Hmon-thá,	86 Lek-ró,
57 T'ouk-k ^h rá,	87 Rau-khát,
58 Krwat-khyí-dóng,	88 Thit-prouk,
59 Pat-thon,	89 Khwau-s'at,
60 Shon-ma-tat,	90 Son-bè,
61 U-shít-thá,	91 Khí-hrá,
62 Ta-bwát,	92 Toung-zi-kon.
63 Nyoun ^g ,	93 Toung-hrouk,
64 Pau-lé-zi,	94 Ka-zú,
65 Lat-tok,	95 Kron-dwát,
66 Ngóng-ni,	96 Ka-moung-krat- sú,
67 Eng-zi,	97 Thit-ka-dó,
68 Pau-le-ka-thit,	98 Thit-lan-hnyi,
69 Kha-moung,	99 Than-bóng,
70 San-brwun,	100 Ra-zo,

Vowel Sounds.

a short as *u* in *but*, or *a* in *America*.

á as *a* in *father*.

e } as in *men*, *let*.

é as *a* in *name* *la*

i as in pit, but sometimes the sound thus represented, is pronounced by Mugs as i in find.

i as ee in feet.

o as in note.

ou as in loud, proud.

u as oo in moon.

u as u in full.

y as in youth, young.

The apostrophe ' denotes an aspiration.

List of the most valuable of the above Woods, with the uses to which they are generally applied by the Natives of the Province, and to which they could be applied with advantage. These are procurable in any quantity, of the undermentioned sizes, and prices, by giving a short previous notice.

No.	Name.	Length.		Price.	Uses.
		feet.	ft.		
1	Myonk-lók, ...	21	3	4 0 0	Generally useful.
2	Myonk-goung, ...	21	3	4 0 0	Ditto ditto.
6	Toung-rankhot, ...	21	3	3 8 0	Useful for Posts, Planks, and Architraves.
7	Kro-tha, ...	21	3	3 0 0	Posts, Rafters, &c.
8	Swun-khri, ...	21	3	3 8 0	Ditto.
10	Toung-prá-non, ...	21	3	3 0 0	Planks and Architraves.
13	Ta-lé, ...	21	3	2 0 0	Used for boat-oars, and house building.
22	Gran, ...	21	3	2 0 0	Generally useful.
26	Práing or Iron-wood, ...	21	3	4 0 0	Possesses remarkable durability and strength, and would answer admirably for Indigo presses.
27	Htá, ...	21	3	5 0 0	Useful for Ship and House building.
31	Ri-than-bon, ...	15	0	2 0 0	Musket butts and furniture.
32	Prá-wá, ...	21	3	2 8 0	Useful for Posts & Planks.
39	Nwa-laing-byaing, ...	21	3	3 0 0	Ditto for Buggy Shafts and elastic purposes.
40	Krat-ró, ...	15	3	2 0 0	Ditto for Posts.
42	Son-thá, ...	21	3	3 8 0	The heart of this tree is very durable.
46	Lon-paik, ...	21	3	2 8 0	Posts, Planks & Architraves.

No.	Name	Length.	Girth.	Price.	Uses.
		feet.	ft.		
47	Tha-bri, ...	15	3	2 8 0	Splits in the Sun but useful if not exposed.
49	Pa-douk, ...	21	3	3 8 0	Posts and Planks.
51	That-rat (Mangoe),	15	4½	5 0 0	For boxes and cases.
52	Than-gou-nat, ...	21	4½	6 0 0	Generally useful "Tilser."
57	Touk-kra, ...	15	3	3 0 0	Planks and Architraves.
62	Ta-bwat, ...	21	3	2 0 0	Very elastic, would answer for Buggy-shafts, &c.
69	Kha-moung, ...	21	4½	6 0 0	A close fibred "Jarroll," used by the Mugs for all purposes, would answer admirably for the beams of Indigo Presses.
76	Lat-pon, ...	21	4½	3 0 0	Used by the Mugs for making Coffins.
77	Ouk-khan-zá, ...	21	4½	3 8 0	Ditto ditto for Dingies and Boats.
81	Prong-pa-zá, ...	21	3	3 0 0	Posts, Planks and Architraves.
82	Ra-ma-ui, ...	21	4½	2 0 0	Generally useful.
83	Pi-nò, ...	21	4½	5 0 0	Used for making Dingies and Boat building.
84	Mrát-swá, ...	21	4½	5 0 0	Generally useful.
85	Kon-gyau, ...	21	4½	3 0 0	Posts, Planks, &c.
94	Ka-zu, ...	21	3	3 0 0	The heart of this tree very durable.
95	Kron-dwát,...	21	3	3 0 0	Useful for Masts and Spars.
97	Thit-ka-dó(Toon),	6 to 6½	4½ 7½	2 8 0	To be had at this price by taking an equal proportion of each size; very useful for furniture.
99	Than-bong, ...	21	4½	3 0 0	Planks for Boat building.
100	Ra-zo, ...	21	3	3 0 0	For Boat building.

REPORT ON SAMPLES OF COTTON, GROWN FROM FOREIGN SEED IN THE GARDEN OF THE BRANCH AGRI-HORTICULTURAL SOCIETY OF BAUGLEPORE;—AT THE GOVERNMENT COTTON FARM AT GORBUCKPORE;—AND AT BOJEPORE FACTORY, NEAR BUXAR.

Extract of a letter from Major T. E. A. NAPLETON, dated Baugle-pore, 29th October, 1844.

“ I shall have the honor of forwarding some Georgia cotton for presentation to the Parent Society next month. The plants are in fine order, and the white ants, with all their destructive powers, have not as yet assailed our little plantation. In my humble opinion, I think our soil vastly well suited for the cultivation of cotton on an extensive scale, but will wait the result of the Committee’s report upon the November samples, before I say any thing more in praise of such a project. In July last, another small cotton field was formed at some distance from the first, and the plants are now in a most flourishing state. A kutchra well has been sunk in it, and the success with which the sinking of this well has been attended is as follows. The first 4 feet from the surface fine rich mould, the next 4 feet a very red clayey soil, and at 13 feet water and a bed of kunkur. There are now about 10 feet of water in the well, the diameter of which is 7 feet 8 inches; not a pukka brick or a bit of mortar is required, and the great facility of irrigation therefore, induces me to think that sugar cane cultivation might also succeed, and whenever our funds will admit of our purchasing a few beegahs more ground for agricultural purposes, it will be an especial object of our Society to promote and improve agriculture in all its branches.”

19th Dec. 1844.—“ With reference to my letter dated the 29th October last, I have now the pleasure to advise you of the despatch, per dak banghy, this day, of one small petarraha of cotton attached to the pods just as it was picked from the plants, and another of prepared cotton, *id est* separated from the seed and carded. The cotton plantation in our Public Garden is merely an experimental one, and we are, before extending the cultivation of it, anxious to be informed by your able Cotton Committee how far we have

succeeded, *i. e.* whether the quality is considered good or superior. Will you therefore oblige our Branch Society by submitting the musters now sent for inspection at the next General Meeting, with our solicitation that the Cotton Committee may be requested to report on them. I may add, that the cotton plants are covered with pods, and a *large crop is certain*, and that what will be gathered during the next month will be of superior quality to that now sent.

“The carded cotton is most indifferently cleaned, the people here being very inexperienced in this requisite.”

17th Jan. 1845.—“I have this day had the pleasure of receiving your letter under date the 13th instant. In reply to the 1st Para. I have to thank you for your intention of submitting the specimens of cotton grown in our public garden here, for the Committee’s report. I have this day forwarded another small packet of Georgia cotton, grown on the same plants as the last, but gathered 6 weeks later, and this latter sample kindly have tested at the same time.”

Extract of a letter from H. C. TUCKER, Esq. Officiating Collector of Gurruckpore, dated January 29th, 1845.

“I have the pleasure of sending you herewith small samples of cotton, and cotton seed from the Government cotton farm at this station.

The cotton was originally American Upland, imported 1840-41, and the first crops grown in Bundlekund, so that this is the 3rd years’ produce from the original seed.

Mr. Blount speaks highly of the seed ; and, in conformity with his wishes, I have made up 28 bags of it, which now await the orders of Government as to their disposal. I should be glad to hear what is the opinion of the Society regarding the cotton, although it is not likely to become a remunerative crop in this district.”

Extract of a letter from P. P. CARTER, Esq. Bojepore Factory, near Buxar, dated July 7th 1844.

“Two years ago, I got a very small quantity of the Mexican cotton seed from the Society, which I made trial of, with such favorable result, that I am inclined to consider it, of all others,

the best adapted for this district at least. All the plants are still in the ground, and in a most vigorous state. I counted the pods of three plants taken at random last cold season, and the average number was 127; they were all of them perfectly sound, and came to maturity, producing the most superior description of cotton I have yet seen in this country; each pod was about three times the size of the common "*kuppass*" of the country, and produced five times as much in pure cotton, and the plants were none of them more than from $2\frac{1}{2}$ to 3 feet high, but very bushy. About six weeks after they came up they began to flower, and have continued bearing ever since throughout the year. The cotton produced during the rainy season is of course inferior to that of the dry months.

"18th Dec. 1844.—I have now the pleasure to advise you of the despatch of a sample of the cotton alluded to in my letter of 7th July, and will be obliged by your submitting it to the Society, and obtaining me a report on its quality."

REPORT ON THE ABOVE SAMPLES OF COTTON.

Cotton from Bauglepore.

1st. Layer harsh and dry, seed much eaten, and consequently will be more difficult to separate from the cotton. Staple irregular in length, and on the average much shorter than good to fair American Uplands; the bulk of the indigenous "*kuppass*" of Surat and Broach is fully equal to this sample, and is easier to clean by the Churka, or the roller gin.

2nd. Layer is cleaner *kuppass*, and sounder seed; the cotton is therefore more easily separated from it. This cotton is longer, and more regular in staple, and consequently more suitable for manufacturing by machinery.

3rd. Layer apparently the same as the 1st and 2nd.

No. 3. Same description of cotton as that in No. 1, basket packed six weeks later:—The staple of this is not so strong as the 2nd and 3rd layers of No. 1, nor does it equal those layers in color.

No. 2. The above *kuppass* cleaned, by what machine not mentioned. I presume either by the saw gin, or common Indian bow, (called

the Dhoonostre) both of which processes are more injurious than the Churka in cleaning such cotton. In all short stapled cotton, it is essential, that what staple there is should be preserved as much as possible. To effect this, the Churka should be used, and the saw gin and Indian bow avoided. This cotton has evidently been much spoiled in the cleaning; it is nibby, and the staple is much broken, and consequently much loss in weight would occur in manufacturing it by machinery in what are called "*flyings*." The cotton is worse in color than the "*kuppass*," whereas it ought to appear whiter. If carefully cleaned by the Churka, a much better cotton than that before me, might be taken from *kuppass* such as No. 3.

The Cotton from Mexican seed, grown at Bojepore factory near Buxar, is of a good healthy color, and tolerably regular in staple, and could be used largely in manufacturing by machinery. It has been carefully cleaned, probably by the Churka, (if not hand picked,) and all that is wanted of this description is *quantity* (especially if by careful attention to the cultivation, the staple could be produced stronger,) if it could be laid down in Calcutta at about Co's. Rs. 10-8 per Bazar maund; which at the present exchange and including freight and charges is about $3\frac{1}{2}d$ per lb. in England, say a quantity increasing from 50,000 bales, (of 3 @ 400 lbs. each) per annum. The greater the quantity sent of such cotton, the more valuable would it become in the home markets, for it is an object with all spinners to adapt their machinery to such descriptions of cotton as they are sure of always finding a market, and therefore less subject to great fluctuations in price.

The "Cotton from American Upland seed, 3rd year's produce from original seed" at Gorruckpore, is a good coloured, healthy looking cotton, and would meet with a ready sale in the English markets, if it could be supplied in large quantities, of uniform quality.

The Agri-Horticultural Society's up-country correspondents might convey some valuable information with reference to these samples now under report; such as the price at which a bazar

maund, or any given weight could be laid down in Calcutta, in quantities not less than 2000 maunds. Various up-country subscribers may have sent numberless mere garden samples showing that good cotton *can* be grown; but can such cotton, which I think likely to be useful for manufacturing purposes by machinery, be produced in a season, say to the extent of 5,00,000 maunds; and can it be laid down in Calcutta at Rs. 10 per bazar maund, or equal to it?

JAMES POTTER.

Calcutta, 26th February, 1845.

Memoranda accompanying a sample of farinaceous powder prepared from the roots of the Tacca pinnatifida, abounding in certain parts of the province of Arracan. By Major D. WILLIAMS.

I have the pleasure to send you to be laid before the Society, the roots of a plant that grows in the island of Chedooba, of which a farinaceous food is prepared equal, if not superior, to the arrow-root. I send two bottles of the meal or powder prepared by me, after the manner the Mugs prepare it for exportation to the Eastward, chiefly, I believe, for the China market. The Mugs, after removing the peel, reduce the root into a pulp by rubbing it on a fish's skin, then strain the pulp through a coarse cloth, wash it four times in water, and dry the powder in the sun for exportation.

I should like to know what root it is.

I enclose in the box a few specimens of our arrow-root; which grows all over Arracan, and is eaten as a vegetable.*

Kyouk Phyou, Arracan, Nov. 10th, 1844.

* The following is a report by Mr. Speede on both these samples:—

"The sample stated to be the produce of the *Maranta arundinacea*, or true arrow root plant, is of good quality, but rather foul, and evidently not sufficiently washed, whence it does not mix so freely as is usual with the well manufactured article to which it is apparently in other respects equal.

The second, from a bulb in Chedooba, is in all respects to the eye corresponding to the true arrow-root, is clean and well manufactured, but is far inferior in strength, requiring at least twice the quantity that is necessary of the true arrow root to make the same strength of jelly; hence unless the article can be produced at very much below the rate of arrow-root it would be unprofitable."

I have had the pleasure to receive your letter by the *Ganges*, and am about to collect more of the plants, which I find to be growing all around me here. What I shall bring with me for you by the next trip of the *Amherst*, (if I succeed in obtaining leave of absence) will have been gathered from an island opposite this place, at the mouth of the Kyouk Phyoo harbor roadstead, and it abounds, I hear, on Saddle island, also close by.

The Chedooba people only, I hear, prepare the powder from it, and use it in no other way. At the island opposite there is now a man from Chedooba making a quantity of powder; it is strange they have never (I mean the Mugs) carried it to the Calcutta market.

I will bring with me both root or bulb and the plant itself.*

The plant is named *Pengbwao*, in the Birman language, and by the Mugs, *Kyweoo*.

It is not used as a vegetable: of the powder a sort of bread or sweetmeat is made.†

The stalks when old fall down and deposit the pod and seed on the ground, whence, as you may imagine, myriads of new plants are generated.

Kyouk Phyoo, Dec. 20th, 1844.

* These have since been received, and referred to Dr. Wallich; and the following is extract from his note:—

"You have gratified me more than I can tell you, by sending me the specimen of this extraordinary plant. It is *Tacca pinnatifida*; it grows wild in the Malay Islands, Cochin China, &c.; perhaps somewhere in the peninsula of India. I never heard of it so near as Arracan. It is always found near the sea. It is the gigantic size, and the locality, not to mention the fine ripe fruits, that delight me so much."

† Dr. Royle, in his *Illustrations of Himalayan Botany*, observes in reference to the *Taccaceæ*, "the plants of this family are possessed of some degree of acidity, both in their tubers and in their herbaceous parts, as Rumphius informs us, that the tubers of *T. pinnatifida*, *dubia* and *montana*, are rasped and macerated for four or five days in water, and a fecula is separated in the same manner that sago is, and like it employed as an article of diet by the inhabitants of the Malayan and Molucca islands. In Otaheite and other Society islands, they make cakes of the meal of the tubers of *T. pinnatifida*, which are the *tacca youu* of some navigators: they form an article of diet in China and Cochin China, as also in Travancore, where Dr. Ainslie informs me, they attain a large size, and that the natives eat them with some acid to subdue the acrimony. Dr. Roxburgh (*Flora Indica*, vol. 2, page 172,) states, that it is "a native of the Moluccas and Malay countries, and from the latter introduced by Dr. Harris of Madras into the Company's Botanic Garden at Calcutta in 1800, where it blossoms in June and July, seeds ripen in October. Root tuberous, perennial, often as large as a child's head, round and pretty smooth; with but few slender fibres from its surface, intensely bitter when raw, but yielding a great quantity of beautifully white starch, of which the best flour for confectionery, puddings, &c. is made."—*Ens.*

Notice regarding the American Sumach, with a recommendation for its culture in India. By N. WALLICH, Esq., M. D.

Botanic Garden, 21st February, 1845.

I have the pleasure to send you a paper of seeds ripened in this garden, during this week, of the American Sumac, or Dividivi, (*Caesalpinia coriaria*.) You will find some notice of this very important tree or shrub in your Society's Transactions, vol. 3, p. 92, from which you will learn that the pod contains more Tannin than any vegetable substance whatever, and that it is highly prized for admixture among tanning substances.*

I would strongly recommend the cultivation of the tree to be widely extended. It thrives remarkably well down here. As every one of the seeds will germinate if sown soon, a very small supply will suffice for each applicant.

I also send a quantity of the drug itself, being the pod of the plant.

Yours sincerely,

N. WALLICH.

[Since the receipt of the above letter, Dr. Wallich has obligingly placed a further supply of seed at the disposal of the Society; of which small quantities are available to any parties interested in the introduction of this useful tree, on condition of their communicating the result of their trials to the Society. Dr. Wallich has also favoured the Society with directions for the culture of the tree, which are here appended. Some further account of an interesting local experiment with the produce of this plant, will appear in the next part of this volume.—Eds.]

On the best Mode of treating the American Sumac.

"With regard to your query about the best mode of treating the American Sumac or "Dividivi," I will tell you all I know of the matter. Sow the seeds as soon as they are ripe, because they are subject to the attack of an insect, to a degree exceeding almost any thing I have ever witnessed even among leguminous plants, to

e

* An extract from the Transactions will be found a few pages further on.

which family our plant belongs. The seeds should be sown in a light garden mould mixed with sand, and rather superficially. They commence vegetating, usually in the course of one week; I have known them come up the sixth day. When the seedlings are a couple of inches high, they should be carefully planted in small pots, singly; and when they have attained say three feet, they may be planted out in the open ground, which ought previously to have been well trenched, and enriched with some manure, if required. The ground must of course be sufficiently high to be exempted from inundations of any sort. In its young state the Dividivi will require a little shading from the too intense sun-rays; but in after years, I mean from the time it has been planted out, I suspect that the less shade is given the more productive will be the return of pod. The distance between the plants should be, at least 12 feet (twelve) in the quincunx-fashion. I should think that, during the first hot season, the plantation may require a little irrigation in very dry and hot weather. I have a notion that the Dividivi would form an excellent shade to coffee trees. It would be worth while trying the experiment."

Comparative return in Liquor and Goor, from certain descriptions of Sugar Cane.

[Extract of a letter from F. Nicol, Esq., dated Chandpoor, Jessore, 16th February, 1845.]

"The following is the return which I got from the various descriptions of Sugar cane, which were cultivated last year upon a small scale.

Name of the Cane.	Average quantity of liquor received from 1 maund of cane by measure.			Average quantity of goor received from 1 gallon of liquor by bazar weight.		
	Gal :	qts.	pts.	Br.	Md.	S. C.
Dholee,	4	1	1	"	"	13
*Otaheite, &c.	4	0	0	"	"	13½
Kajolee,	3	0	1	"	"	19
China,	3	0	0	"	"	15

The Otaheite had been nearly destroyed by the white ants, if I had not cut it early. Not satisfied with attacking the lower part, they got into the middle of the cane, and so eat upwards; a great many withered and died off before the cane got to any size. The Otaheite, Bourbon and Singapore got mixed together in the cutting, and the above of course cannot be considered as a correct return of Otaheite alone; in fact, it has not had a fair trial. The cane grew to no height, owing I suspect to the poorness of the soil, which was too sandy and dry. Of the other three descriptions, the Kajoollee was decidedly the best; the cane was quite ripe, and the liquor quickly boiled and showed its saccharine matter. The Dholee cane was not quite ripe when cut, but from the white ant destroying it in such large quantities, I was obliged to take it off the ground; had it not been for this, the best return would have been received from it. The China cane thrived the best, and grew to a great height, quite overtopping all the others. Several plants measured 9 feet high, the white ants did not touch it, and it is certainly the best description for land at all infested by these destructive insects. In a former note I informed you of my misfortune in losing three-fourths of the cuttings, which I purchased from the Society's nursery. This first experiment, therefore, was upon such a small scale, that I kept no account of the quantity of ground which the cane occupied, or the expense of cultivation. For this year I will keep a regular Journal of Proceedings, and let you know the result."

Effect of Galvanism in promoting the growth of Potatoes.

Communicated by W. HAWORTH, ESQ.

JAMES HUME Esq. *Honorary Secretary of the Agricultural Society.*

DEAR SIR,—I herewith forward you two samples of potatoes, being the result of an interesting experiment I have lately had tried in my garden here.

Some time ago, and rather out of the regular season, six sets, or cuttings of potatoes, were put into the ground, each having one germinating eye, merely to try if they would produce as good fruit in this soil as the original stock, which were English. After they had been

in the ground about 8 weeks, I read in one of the papers, an account of an experiment which had been tried at home, of employing Galvanism to promote the growth of potatoes, and which had resulted very satisfactorily; this information caused me to place three out of the six roots mentioned above, under the influence of Galvanism, leaving the other three roots to grow in the usual way. In about 7 weeks after this, all the roots appeared to have arrived at maturity at one period, as shewn by the gradual decay of the stalk.

I had them taken up yesterday, well washed, and left to dry until this morning, when I weighed them. The *three* roots grown in the usual way, produced together 26 potatoes, varying in size, and weighing $14\frac{1}{2}$ ounces. The *three* roots grown under the influence of Galvanism, produced together 32 potatoes, weighing $27\frac{1}{2}$ ounces, being very nearly double the weight of the produce of the roots grown in the usual common way. There is nothing extraordinary in the size or appearance of the potatoes; the ground in which they were produced was very hard and poor.

Your's very truly,

Cossipore, 12th March, 1845.

WILLIAM HAWORTH.

MODE OF PRESERVING GRAIN FROM THE RAVAGES OF THE WEEVIL.

To JAMES HUME, Esq. Secretary to the Agricultural Society of Calcutta.

SIR,—“A general meeting of the Society was held at the Town Hall on the 14th August,” at which there was a communication from a person in Gorruckpore, headed “Experiments with the wheat in the Gorruckpore district;” now as I differ in my ideas from the writer of the above remarks, I have been induced to give him a hint through you, the Secretary, and in fact to all those concerned, and not to Mr. Bridgman alone, so that he, or any other person, may rectify their error hereafter when they have occasion to store away small quantities of wheat and other grains.

“The fate of the produce may assist in illustrating the effect of the weevil. The different grains, after being gathered, were put into baskets, and kept within my own house for a few days, while new earthen pots were being made to preserve them in.”

Allow me to ask the writer this question,—Whether the pots were baked in the sun or in the kiln? If by the latter, it is accounted for; but if on the other hand, I am at a non plus for arguments, so I treat of facts only.

I once bought some wheat for home consumption, and put it into a baked ghooree from the Komars, at the end of the harvest time, or rather at the end of the hot weather; the mouth was well plastered down and air-tight: at the close of the rains or may be after 3 or 4 months, a jar was opened, and found to be eaten by the weevil, fully to the extent of one-half, which was grinded like flour as from a *chukee*; the other, the grain was perfectly whole. I was told by the people of the neighbourhood, that this destruction of the grain was all caused by the jar, (which generally contains 3 or 4 maunds,) being kiln-burnt, for had it been sun-baked, no damage would have accrued. No native ever keeps his home consumption grain in any thing else but the kutchas ones, for the pukka ghoorees are all condemned on that account. One, I dare say, might have seen a large square earthen grain storer in a native's house, particularly when he is making a new chopper for his roof, out in the country I mean.

As to accounting for this by theory, why there should be this, or in fact any difference, I am at a loss:—as I have experienced, so I have advanced my assertion.

The concluding remark I have to add is one of theory, that I read somewhere years since; one perhaps whether in much use, or not, I can't say;—before filling the pits with grain (say wheat,) the inside ought to be sprinkled with a solution of corrosive sublimate in a little water, and when perfectly dry, to commence filling; no weevil touches this grain.

Though not having the honour of being a Member of the Society, I trust this communication will not be taken amiss by them, and if agreeable I might go on from time to time, with my ideas.

I am, &c.

G. G. MERCER.

INTRODUCTION OF AMERICAN MAIZE IN AJMEER AND MHAIRWARRA.

To JAMES HUME, Esq. Secy. to the Agricultural Society of Calcutta.

SIR,—On my requisition, you were good enough during the past year, to send me a packet of American vegetable and flower seeds, amongst the packets were 5 or 6 kinds of Indian corn, called in this part of the country, Mukka. The seed was distributed by grains to the different Purgunnahs of Ajmeer and Mhairwarra, under my superintendence. Owing to the injury sustained from the ravages of locusts, the seed was only productive at one spot; the small quantity that has been produced, is so superior in produce and grain to the common Mukka of the country, that I am solicitous of obtaining a larger supply than is afforded from the small packets where the grains can be counted. I am not aware whether you have the ability to meet my requisition, but should means exist, I should desire that one seer of each kind be forwarded to me. Mukka is grown very extensively in these districts during the Khureef; it is therefore desirable to supplant the produce of the country by good American seed; which, from the sample I have seen during the past year, promises to be more productive to the cultivator and to the Government than that usually sown. Should you possess the ability, I shall be thankful to you to send me as above requested, about *one* seer of each kind of American Indian corn. Messrs. Cockerell will forward the articles to me either by dawk banghy, or by steamer to Allahabad, and thence by land to Ajmeer. Independently of this solicitation, I would beg to request you will be good enough to send me, through Messrs. Cockerell and Co. a packet of English or American vegetable and flower seeds at your convenience, so as to reach Ajmeer before the setting in of the ensuing rains.

I remain, &c.

Mhairwarra, 26th Jan. 1845.

C. G. DIXON, *Major,*
Supt. Ajmeer and Mhairwarra.

SIR,—I have had the pleasure to receive your note of the 8th ultimo, and have to offer to you my best thanks for the promptness

with which you have answered my requisition ; the liberal supply of acclimated American maize* you have so kindly sent to me, will be distributed, on arrival, in the different Purgunahs of Ajmeer and Mhairwarra ; and in September and October next, on the corn ripening, I shall have much satisfaction in reporting the result of its produce.

I am thankful to you for your offer of a further supply ; but as our sowing season commences about the middle of June, the despatch would reach us too late for the season ; with the supply you have sent, and with the small stock I have in hand from last year's produce, I hope to reap a harvest of some maunds ; thereby obviating the necessity of again troubling you on this score.

Thanking you for your offer to send me a small packet of American and English seeds, flower and vegetable,

I remain, &c.

Ajmeer, 16th March, 1845.

C. G. DIXON, Major.

Report on the Garden of the Branch Agri-Horticultural Society of Cuttack ; with an account of Exhibitions of Vegetables held at that Station. Communicated by Capt. W. W. DUNLOP, Secretary of the Society.

To the Secretary to the Agri-Horticultural Society of India.

DEAR SIR,—Agreeably to the intentions expressed in my last letter, I have now the pleasure to forward you a report on the Branch-Society's Garden at Cuttack, together with the result of our prize exhibitions.

Sugar Cane.—Otaheite. The crop very good, although to the latter end of the season attacked severely by white ants. Distributed five hundred canes, and disposed of the remainder in the bazar, as there was no further demand for planting. In fact, there is very little sugar cane grown in this district ; that which has been distributed, however, being far superior to the common kind in cultivation, may induce its extended culture.

* This maize is the produce of the Society's Nursery, and though produced out of season, is a near approach, in every respect, to the original stock.

Cotton.—New Orleans $\frac{N.O}{B}$ and $\frac{N.O}{R}$ from seed* received from the Parent Society in a healthy state, and a small quantity collected; a specimen of which, when it comes into full bearing, I will send you.

Maize.—American. Very fine. Besides that distributed as mentioned in my letter of the 25th September, 1844,† I have lately had an opportunity of distributing a small quantity in the villages of the district through which I passed on a shooting excursion.

Tobacco.—Bhilsa, Gibali, Persian, Sandoway, flourishing.

Trefoil.—Baugleapore and Cabool Lucerne, failures, the seeds germinate, but the plant is very stunted in its growth.

Senna.—Tinnevely, few seeds germinated; the plants from which are healthy. I shall endeavour to save seed from these, and extend the cultivation.‡

Cauliflowers.—Grown from seed saved at Cuttack, very fine and large, far exceeding in size and flavour that raised from seed received from any other place. I am saving a quantity of this seed, and should you wish it, will have much pleasure in sending you some.§

Knolcole.—From Madras seed, good, it will not seed at Cuttack, at least it has not hitherto done so.

Cabbage.—Cape and American seed of several varieties have turned out well.

Celery.—Good.

Pease.—Imperial blue, Marrow-fat, Dwarf, &c. are good, and bear fair crops.

Beans.—Broad Windsor comes into flower, but seldom pods.

Kidney Beans, French, Dwarf Canada, &c. &c., all flourish remarkably well.

* This is the New Orleans seed grown in black and red soils at the Coimbatore Cotton Farms, and forwarded to the Society by Dr. Wight. See Journal of the Society, vol. 2, p. 321—Eds.

† This letter will be found in vol. 3, p. 198. The superiority of the American maize over that of the country, is also referred to by Capt. Hollings, whose report will be found at p. 195 of the same volume. See also Major Dixon's report in the foregoing page.—Eds.

‡ This seed was presented to the Society by Mr. James Cowell. See vol. 2, p. 127, where will also be found some practical remarks on the culture and preparation of this valuable plant, from the pen of Dr. Wight.—Eds.

§ This has since been sent by Capt. Dunlop.—Eds.

Potato.—Has hitherto been grown from small bad waxy seed : an attempt will be made this year to remedy this by procuring seed from Nundidroog, in the Madras Presidency, where the potatoes are excellent.

Turnips of all kinds grow well here.

Carrots.—Ditto ditto.

Beet Root.—Ditto ditto.

Radishes.—Ditto ditto, but the fine descriptions of radish do not seed.

Sweet Potatoe.—Nothing particular ; some which I brought from Madras, where it is styled the Antilla Potato, and planted in my own garden, has turned out very large and fine, of the white kind. I intend to plant some of it in the Society's Garden this year, and should be glad to send you a few roots, that it might be ascertained whether it is the same Potatoe mentioned in the Journal of the Society of India, as the Mauritius Sweet Potatoe.*

Bush Squash.—American ; very fine and delicate ; much superior to the Vegetable Marrow.

Onions.—Patna and Surinugur thrive well.

Besides the above, there are large Tomatas, Brinjals, Capsicums, Artichokes, and Jerusalem Artichokes, Asparagus, Endive, Cucumber, Lettuce, &c. &c. all which thrive tolerably well, with the exception of the Artichoke, which produces but a small head, and dies off during the hot winds.

The exhibition of vegetables, &c. took place on the 25th December 1844, 1st January, and 1st February 1845, when the following prizes were awarded ; the Society's Garden being excluded from competing :—

Prize for Cauliflowers,	...	...	Mr. Gilmore's Mallee.
1st January 1845. Best	{ divided — }	{ between — }	Captain Dunlop's ditto.
general show of vegetables,			Mr. Trevor's ditto.
Peas,	...	...	Col. Garnault's ditto.
Knole Kole,	...	...	Capt. Dunlop's ditto.
Lettuce,	...	...	Dr. Minto's ditto.

* A few roots have since been received from Captain Dunlop, and found to be identical with the Mauritius Sweet Potatoe.

Beet Root,	...	...	...	...	Mr. Gilmore's ditto.
Turnips,	...	...	...	...	Dr. Minto's ditto.
Bouquet of flowers,	...	{	divided	—	Mr. Trevor's ditto.
			among	—	Mr. Gilmore's ditto.
				—	Mr. Lacy's ditto.
1st February 1845. Best general show of vegetables,	{	divided between	—		Col. Garnault's ditto.
					Mr. Trevor's ditto.
Show of foreign vegetable,	...	...	...	...	Capt. Dunlop's ditto.
Bouquet of flowers,	...	...	...	...	Mr. Trevor's ditto.
Celery,	...	...	...	...	Mr. Mill's ditto.
Potatoes,	...	...	...	...	Col. Garnault's ditto.
Carrots,	...	...	...	...	Capt. Righy's ditto.
Onions,	...	...	...	...	Mr. Mill's ditto.
Cabbage,	...	...	...	...	Mr. Trevor's ditto.

The medal prizes (given by the Parent Society,) have been reserved for a future occasion.

I am, &c.

Cuttack, 3d Feb. 1845.

W. W. DUNLOP,
Secretary Cuttack H. Society.

An account of the First Horti-Floricultural Exhibition of the Lucknow Branch Society. Communicated by Captain G. E. HOLLINGS, Secretary of the Society.

MY DEAR SIR,—I have the pleasure to forward a list of the prizes given at our first exhibition, which went off more successfully than we anticipated, and I have little doubt that on each succeeding occasion, the Lucknow Agri-Horticultural Society will have more and more reason to congratulate themselves on having resolved to hold periodical exhibitions. The mallees appeared to be delighted with their rewards, which were paid on the spot. Our Horticultural Garden is called by the natives Char Bagh, and it will be seen that one of the mallees employed therein was the most successful candidate.

Some of the specimens were very good indeed, and the celery was very much admired. It was cultivated by Nannoo, under the espe-

cial direction of the Chowdry Nundloll Misr, who saw that all the instructions given by different gentlemen who visited the garden, but more particularly by the Rev. Mr. Carshore, were attended to. If any Member would wish to know how the celery was cultivated, I will send you the particulars in English and Hindoostanee.* There was a very small number of strawberries exhibited, but those were of a large size, which affords promise of a fine crop this year. The sugar cane was much finer than the canes you sent to me by the Steamer, which I am sorry to say have failed. I have not been so much pleased with any garden I have seen in India as I was with Colonel Hervey's, nor have I ever beheld English flowers so beautifully cultivated.

I am, &c.

Lucknow, 13th Feb. 1845.

G. E. HOLLINGS.

List of Prizes paid to different Mallees, on the 12th Feb. 1845.

VEGETABLES.		Rs. As.		Brought over,		Rs. As.	
<i>Cabbages.</i>		<i>Rs. As.</i>		<i>Turnips.</i>		.. 19 0	
Dyal, Residency mallee,	..	2	0	For size and weight.			
Nannoo, Char Baugh ditto,	..	2	0	Dyal, Residency mallee,	..	1	0
<i>Artichokes.</i>				For colour and smoothness,			
Dyal, Residency mallee,	..	1	0	Sobha, Major Wilcox's mallee,	1	0	
<i>Potatoes.</i>				<i>Knole Cole.</i>			
Sobha, Major Wilcox's mallee,	2	0		For size.			
Nannoo, Char Baugh,..	..	1	0	Nannoo, Char Baugh mallee,	1	0	
<i>Red Cabbage.</i>				For smoothness.			
Nannoo, Char Baugh,..	..	1	0	Hinga, Residency mallee,	..	1	0
<i>Beet Root</i>				<i>Kohl Rabi.</i>			
Dyal, Residency mallee,	..	1	0	Bukhtowur, Captain Fraser's			
Nannoo, Char Baugh, ..	..	1	0	mallee, ..	..	1	0
<i>Peas.</i>				<i>Jerusalem Artichokes.</i>			
Sukut, Lt. Fenwick's mallee,	2	0		Dyal, Residency mallee,	..	1	0
<i>Tomato.</i>				Bukhtowur Captain Fraser's			
Sukut, Lt. Fenwick's mallee,	1	0		ditto, ..	..	1	0
Dyal, Residency mallee,	..	1	0	<i>Onions.</i>			
<i>Banghun.</i>				Sobha, Major Wilcox's mallee,	1	0	
Bukhtowur, Captain Fraser's				Nannoo, Char Baugh,..	..	1	0
mallee, ..	..	1	0	<i>Cabool Capsicum.</i>			
<i>Carrots, orange.</i>				Munsa, Char Baugh mallee,	..	1	0
Nannoo, Char Baugh,..	..	1	0	<i>Lettuces, Green Coss.</i>			
<i>Ditto white.</i>				Nannoo, Char Baugh mallee,	1	0	
Dyal, Residency mallee,	..	1	0	<i>Drum head Cabbage.</i>			
<i>Cauliflower.</i>				Sobha, Major Wilcox's mallee,	1	0	
Shobha, Major Wilcox's Mal-				<i>Endive.</i>			
lee, ..	..	1	0	Dyal, Residency mallee,	..	1	0
Carried over,		..	19 0	Carried over,		..	32 0

Capt. Hollings has been requested to oblige the Society in this instance.—Eds

	<i>Rs. As.</i>		<i>Rs. As.</i>
Brought over, ..	32 0	Brought over, ..	44 0
<i>Early Bush Squash.</i>		<i>Citron.</i>	
Nannoo, Char Baugh ditto, ..	1 0	Dhurum Doss, Residency mal-	
<i>Beans, Long.</i>		lee,	0 8
Dhurum Doss, Residency mal-		<i>Oranges.</i>	
lee,	0 8	Dhurum Doss, ditto ditto, ..	0 8
Dyal, ditto ditto,	0 8	Hoolass, Char Baugh ditto, ..	0 8
<i>Celery.</i>		<i>Plaintains, (Chumpu.)</i>	
Nannoo, Char Baugh mallee, ..	3 0	Bukhtowur, Captain Fraser's	
<i>Spinach.</i>		mallee,	0 8
Dhora Bhugut, ditto ditto, ..	0 8	<i>Ditto large.</i>	
<i>Yams.</i>		Munsa, Char Baugh mallee, ..	0 8
Munsa, Char Baugh mallee, ..	0 8	<i>Gooseberries.</i>	
<i>Tooraie.</i>		Sukut, Lt. Fenwick's mallee, ..	0 8
Bukt, Lt. Fenwick's mallee, ..	0 4	Bechooa, Capt. Fraser's ditto, ..	0 8
<i>Soup Herbs.</i>		<i>Sweet Limes.</i>	
Bukhtowur, Captain Fraser's		Dyal, Residency mallee, ..	0 8
mallee,	0 4	Keerah, ditto ditto,	0 8
<i>Radishes.</i>			48 8
Sewdeen, Char Bagh mallee, ..	1 0		
<i>Garlic.</i>		FLOWERS.	
Dyal, Residency mallee, ..	1 0	<i>Violets.</i>	
	40 8	Sobha, Major Wilcox's mal-	
N. B.—The Celery was consi-		lee,	1 0
dered by the judges to be the		<i>Heartsease.</i>	
best specimen they had seen in		Colonel, Hervey's mallee, ..	2 0
India.		<i>Geranium.</i>	
		Nannoo, Char Bagh mallee, ..	1 0
FRUITS.		<i>Indian Pink.</i>	
<i>Pumplenose.</i>		Heera, Residency mallee, ..	1 0
Bukhtowur, Captain Fraser's		To seven mallees, Bheekharee,	
mallee,	0 8	1st, Munsha, Nannoo, Lokaie,	
<i>Strawberries.</i>		Bhowanee, Sewdeen and Bhee-	
Munsa, Char Bagh mallee, ..	1 8	kharee, 2nd, eight annas each,	
Sukut, Lt. Fenwick's ditto, ..	1 8	and Motee one rupee,	4 8
		<i>Specimens of Sugar Cane.</i>	
Carried over, ..	44 0	Bieram, Capt. Bird's mallee, ..	2 0
		Total Rupees,	60 0

After the exhibition was over, Colonel Hervey's mallee brought three *dhallies* of vegetables; the specimens of "kohl-rabi," drum head cabbage, lettuce and white banghun, were considered better than those to which prizes had been given; in consequence of which a reward of five rupees was given to the mallee. The splendid collection of flowers from Colonel Hervey's garden was not exhibited.

G. E. HOLLINGS,
Secretary, L. A. H. Society.

*Horti-Floricultural Exhibition of the Bhauglepore Branch Society.
Communicated by Major T. E. A. NAPLETON, Secretary of the
Society.*

MY DEAR SIR,—I have now the pleasure to enclose an account of our last Horticultural Exhibition, which kindly submit to the Parent Society, with our hope that it may be considered satisfactory.

I remain, &c.

T. E. A. NAPLETON,
*Secretary, B. B. A. H. and Floricultural Society.
Cleveland House, Bhaugulpore,
the 23d of January, 1845.*

*Bhaugulpore Branch Agri-Horticultural and Floricultural
Society, held on the 16th January, 1845.*

The second show of the season took place at 3 o'clock this afternoon, and notwithstanding the absence from the station of several supporters of the Institution, there was a large assemblage of both subscribers and visitors.

The Umpires were the Rev. J. MacCallum, Captain Don, Mud-dun Tackoor, Hafiz Surfuraz, Ullee Khan Bahadoor, and the Agga Sahib, who first proceeded to inspect the produce of the Society's Garden, which consisted of several bouquets of rare and beautiful flowers, a few specimens of Agricultural produce, viz., Georgia cotton, Havannah tobacco, mangul wurzul, trefoil and lucerne; and in the vegetable department there was a remarkably fine display, consisting of peas, potatoes, artichokes, vegetable marrow, coss and cabbage lettuce, endive, brinjals, love apples, three sorts of turnips, three sorts of carrots, Cabool capsicums, West India arrow root, beet root, onions, leeks, turnip, and long red radishes, broad and French beans, turnip, cabbage, nohl kohl, and Jerusalem artichokes. The Umpires were pleased to pronounce the above "first rate," and remarked on the rapid and great improvement which has taken place since last year.

Next came the baskets of vegetables, and other specimens intended to compete for prizes. The dalkes were so very numerous that the show rooms could not contain them, and several extra tables were arranged under the trees for their accommodation.

Prizes were awarded as follows :—

To Dr. C. Stuart's mallee. For some remarkably fine celery, cauliflowers, cabbage of sorts, lettuce and endive.

To the mallee of G. F. Brown, Esq. For some very fine Darjeeling and Cherra Poonjee potatoes and onions, and for the best euphorbia in the Floricultural Department.

To the mallee of J. Pontet, Esq. For the best artichokes, turnips, leeks, herbs, long red radishes and carrots.

To Mr. J. Piron's mallee. For the best beet root, the best red cabbage, and the best sample of cotton.

To Mr. John Glass' mallee. For the best arrow root, and the best bouquet of myrtle in the Floricultural Department.

To Baboo Gooroo Churn Mitter. For the best mangul wurzul, second best cabbage, turnips, potatoes, cotton, tobacco, herbs, trefoil, brinjals, pumkins, and for the best indigenous beans and turmeric.

To Cleveland House mallee. For the best peas, broad beans, crown vegetable marrow, French beans, carrots, clover and lucerne, and in the Floricultural Department for the best roses, [seven, sorts] heletrope, passion flowers, zinnias, sweet briar, russelias, and verberna.

To Captain Don's mallee. For the best bouquets of geraniums, lupins, nasturtians, mignonette, and larkspur.

To Peerzadah Shaw Enayut Hoossain's mallee. For the best tobacco and spinage.

To Moulvee Mahomed Rafiq's mallee. For 2d best carrots, 3d best potatoes, 2d best radishes, 2d best onions, and for the best bouquets of indigenous flowers.

To Ubdoolah Khan's mallee. For the best chillies.

To Muddun Tackoor's mallee. For the 2d best cauliflowers.

To Moonshee Waris Ullee's mallee. For the 2d best beet root.

To Rajah Oodit Narain's mallee. For the 2d best brinjals.

To Hoollas, mallee of Mr. C. H. Barnes at Colgong. Prizes for peas, broad beans and American squash.

To the mallee of Baboo Oomanauth Ghose. For 2d best bouquet of indigenous flowers. .

The Umpires particularly remarked the vast improvement in the various samples brought forward for competition since last

year. The setting sun told the assembly that it was time to bend their steps towards home, and in the Fruit department the specimens were not brought forward, owing to the lateness of the evening.

The accurate decision of the Umpires, and the admirable manner in which they discharged their duty, gave general satisfaction, and here closed the second show of the season 1844-45.

It is very gratifying to our Society to be able to announce the names of the following new subscribers, since our last report on the 19th of November, 1844.

Captain B. M. Loveday, A. D. C. to Major General E. H. Simpson.

Dr. Kinsay, Civil Surgeon, Purneah.

G. W. Brown, Esq. Deputy Opium Agent, Purneah.

C. C. Crigan, Esq. 5th Regiment N. I. Dacca.

Basil Landale, Esq. Tirhoot.

Rajah Jye Mungul Sing of Gidhour.

Baboo Bridgebaharee Loll, a large Zumeendar of Tirhoot.

Baboo Fukeerah Misser, a large Zumeendar of Tirhoot.

Baboo Kunhya Chowdry, a large Zumeendar of Tirhoot.

Moonshee Kalleepershaud Pandey, of Kurruckpore.

Moulvee Niyamut Ollah, of Bhaugulpore.

Moonshee Prem Laul, of Bhaugulpore.

The following donations are gratefully acknowledged.

From Baboo Fuqeerah Misser, 5 0 0

„ Baboo Bridgebaharee Loll, 5 0 0

„ Baboo Kunhya Chowdry, 5 0 0

From Muharaj Bedanund Sing. Some grafts of the famous sapota, also a magnificent specimen of indigenous squash for seed.

From the Parent Society, a splendid supply of imperial peas and French beans.

From the Secretary, upwards of a thousand plants for the Floricultural Department.

T. E. A. NAPLETON,

Secretary.

AMERICAN SUMACH.

To Chemists, Dyers, Tanners, and others.

The American Sumach, of which an experimental cargo is now on its passage to Liverpool, is the product of a tree which grows abundantly in many parts of South America, and possesses properties which render it decidedly more valuable, both to the Dyer and Tanner, than either Oak Bark, Catechu, Kino, Sumach, or the best Aleppo Galls. It contains, according to the able and scientific analysis of Mr. Samuel Rootsey, of Bristol, on a mean of two experiments, 76.25 per cent. of soluble or extractive matter, while Galls yield only 59.166645, Sumach (Common) 40, Kino 40.4167, Catechu 67.08335, and British Oak Bark 30 per cent. Its most important constituent, however, in a commercial point of view, is *tannin*, or that principle which by its union with animal matter, constitutes leather, of which the same experiments shew it to contain a mean of 51.1680 per cent. while the best Aleppo Galls yielded only 35.45835 per cent., Sumach 0.95834, or less than 1 per cent. and the best British Bark 13.4167 per cent. A tabular view of the results of Mr. Rootsey's experiments may be seen in Jameson's Edinburgh Philosophical Journal, and an abstract of these results in the Gardener's Magazine for August, 1834, under the name of *Dividivi*.*

The substance has been largely and profitably employed in the tannery of Mr. John Nethersole, near Kingston, Jamaica, for some years past; and, from trials which have been made in England by skilful professional Tanners, it has been ascertained that one pound of the American Sumach is equal to four pounds of the best British Oak Bark, and tans the leather in two-thirds less time; whence there results a gain of not only two-thirds of materials, but also of two-thirds of time. To the Dyer it will prove still more valuable—while Chemists will find their advantage in substituting it for Galls in the manufacture of ink, in forming ointments for the cure of hæmorrhoidal complaints, &c. &c. Taking the per centage of tannin as a standard of comparison, the intrinsic value of the American Sumach is equal to 1.443, or about $1\frac{1}{2}$ of the best Aleppo Galls—hence the market value must always be estimated from the current price of that article.

Persons wishing to make trial of this new article, are requested to apply (post or carriage free), to Messrs. Vianna and Jones, Liverpool, to whom the cargo is consigned, to Mr. Samuel Rootsey, Chemist, &c.

* This abstract is appended—Eds. Journal, A. and H. S.

Bristol; to Messrs. Balkwill and Sons, Chemists, Old Town-Street, Plymouth; or to Dr. Hamilton, late Secretary to the Royal Devon and Cornwall Botanical and Horticultural Society, by whom every information required will be furnished, and with whom samples may be seen. As the quantity expected is but small, and the arrival of the cargo may be daily looked for, those who wish to become purchasers are requested to be early in their applications.

Plymouth, October 3rd, 1834.

The *Cassalpinia coriaria* varies in size according to the richness of the soil, from a shrub to a large timber tree; the timber of which is valuable for many purposes of domestic economy and for building. It grows in the *hottest*, most sandy and arid soils, in which it appears to thrive better than in colder situations. In hot situations plants raised from the seed will flower in the third year of their growth, and will perfect their pods in the following year. In Carthage, December and January are flowering months, but the plants raised from seed which I sent to Jamaica in 1829, and which was sown sometime about the month of October, flowered for the first time in August, 1832, and in the same month in the following year after flowering, the branches, which are slender, were bent down with the weight of pods. In Carthage, the pods are left on the trees till the high winds in March bring them down, when they must be gathered and housed before the April rains commence. From the experiments made on Oak bark, however, by Sir Humphrey Davy, I should be inclined to think they would be found richer in the tanning principle if gathered by hand about the full moon of the month in which they attain their full growth, but before the sap has begun to descend, and the green colour to give place to the mahogany hue of maturity. Oak bark is found to contain one quarter more tannin in spring than in autumn. The tannin resides wholly in the brittle exterior coat of the pod, all the rest being comparatively worthless; hence after dyeing, the pods should be ground in a mill and the refuse (amounting to one-fourth of the whole) separated by sifting. This refuse, though not worth the expense of freight, may be applicable to many useful purposes for dyeing, &c. on the place of production. In times of scarcity the pods are eagerly devoured by cattle. While young and soft, the pods are punctured by a small active little winged insect of a greenish colour, which deposits its eggs within, where they are hatched, and the young insects bury themselves in the seeds, the farinaceous portion of which they live upon as in the accompanying specimens of hollow seeds.

This insect is, as Mr. Loudon, to whom I sent some for examination, informs me, a species of *Bruchus* similar to that which preys on the seeds of the family of *Brassicæ*, but has not hitherto been described by any Entomologist. I have named it for the present *Bruchus Cæsalpinia*, or the Dividivi *Bruchus*. I have frequently received it alive from Carthage along with the seeds. A few specimens of dead *Bruchi* accompany this. How far the depredations of this insect are injurious to the pod itself must be determined by experiment.

In forming plantations of the *Cæsalpinia coriaria* the trees should not be closer than 18 feet; whence an English acre will contain 135; and taking the average weight of produce from each when in full bearing at 100 lbs., the harvest will amount to 135,000 lbs., the nett produce of which when ground and freed by sifting from the refuse, should be at least 101,250 lbs. or 45 tons 4 cwt. and 2 lbs.—a return fully equal to that of the cane, and obtainable from land unfit for producing sugar.

W. HAMILTON.

The Dividivi, or Cæsalpinia Coriaria, as a Tanning Plant.

A letter from Jamaica, by one of the last packets, furnishes me with important information, which enables me to fix with the greatest accuracy the age at which seedling plants of the *Cæsalpinia Coriaria* come into bearing. Dr. Bancroft's words are as follows:—

“Having recently obtained some particulars concerning the dividivi, I can state that it flowered in August last, for the second time, in about the fifth year of its having been planted: the first time was about twelve months before. There were no pods then produced, but an abundance of them last year, so that the branches were bent down with them. The flowers were yellow.” The letter, from which this extract is taken, is dated the 17th of April, 1834. Hence the first time of flowering must have been somewhere about August, 1832, and the second in August, 1833. Now, upon referring to my memoranda, I find that the first supply of seed I sent went by the *Emulous* packet, which sailed in June, 1829, and reached Jamaica in the course of the following month; so that the seed could hardly have been sown much earlier than August, 1829. Hence, in 1832, the plants were only three years old, and in 1833 only four, not five, as Dr. Bancroft, from forgetfulness, states; though, even taking his estimate, it is more favourable than that of any other staple product of the West Indies, except sugar, which yields its crop in nine months: coffee, it is well known, does not come into bearing in less than seven, nor cacao, in general, under

ten years. I shall subjoin a table illustrative of the comparative value of the dividivi, as measured by that of other astringent substances, calculated from the able experiments of Mr. Rootsey of Bristol, and confirmed by the results of experiments made both here and at Sandwich.

Results of the infusion of 60 grs. in 5 oz. of water.										
Number of Experiments.	Number of grains of matter which was		Proportion per cent of matter which was		Number of grains of leather obtained by Mr. Roobey from half an ounce of the infusion, or 6 grs. of the powdered substance, and a solution of iinglass. Consisting of					Proportion of tannin contained in 100 parts of each substance, as deduced from the experiments detailed in the 6th, 7th and 8th columns of this table.
	Soluble.	Insoluble.	Soluble in water.	Insoluble in water.	Grains of Leather	Grains of Tannin.	Grains of Gelatine.			
Dividivi	First 46	14	76-6667	23-3333	7-5	3-45	4-05	57-5		
	Second 45-5	14-5	75-8333	24-1667	5-75	3-645	3-105	44-886		
	Mean 45-75	14-25	76-2500	23-7500	6-625	3-0475	3-5775	51-168		
Nut Galls	First 35	25	58-3333	41-6667	4	1-84	2-16	80-6667		
	Second 36	24	60	40	5-25	2-415	2-835	40-35		
	Mean 35-5	24-5	59-166645	40-833355	4-625	2-2275	2-4975	35-45835		
Sumach	First 25	35	41-6667	58-3333	0-125—	0-0575	0-0675	0-95834		
	Second 23	37	38-3333	61-6667	melted					
	Mean 24	36	40	60						
Kino	First 22	38	36-6667	63-3333	melted					
	Second 26-5	33-5	41-1667	58-8333	ditto					
	Mean 24-25	35-75	40-4167	59-5833						
Catechu	First 40	20	66-6667	33-3333	melted					
	Second 40-5	19-5	67-5	32-5	ditto					
	Mean 40-25	19-75	67-08335	32-91665						
Oak Bark	First 19	41	31-6667	68-3333	1-75	0-805	0-945	13-4167		
	Second 17	43	28-3333	71-6667						
	Mean 18	42	30	70						

W. HAMILTON, *Plymouth, May, 1834.*

DIRECTIONS FOR CULTIVATING MADDER.

[A fine supply of about two maunds of Madder seed having been lately received by the Society from Avignon, (in accordance with resolutions passed at the general meetings of 11th September and 9th October, 1844) through the great kindness of Messrs. Salavy, & Co. Bankers of Marseilles, and through the friendly agency of James Cowell, Esq. Merchant of this city, and a member of the Society,—with whom originated the present recommendation for attempting the culture of this useful plant in India,—the Committee of Papers consider that a reprint from the transactions of the Society, vol. 2, p. 227, of the following directions communicated by the late Mr. Geo. Hodgkinson, may be useful to parties desirous of making experiments with the seed.]

To JOHN BELL, Esq. Offg. Sec. Agricultural and Horticultural Society.

SIR,—I have the pleasure to send for distribution a box containing madder seeds, commissioned by me from Smyrna, and just received from England, along with the following directions for the cultivation of the roots.

“The soil should not be too moist; preparations are first made by digging the ground in the month of March, to the depth of 8 or 10 inches, which is repeated in July and again in August, care being taken to remove all weeds. In March following, the seeds are sown in the manner of corn, and they spring up in May; meanwhile the ground should be well weeded. In July the plants wither, and in October the ground is carefully turned up round them to protect them from the cold in winter: in March following the ground is again turned up or raked, and in June the plants produce seed, and in July they are cut down in the manner of corn. In the third year the roots may be taken out of the ground, but are still small, and if left longer, the quantity is of course increased.

They will produce for ten years or longer, but great care must be taken to rake and weed the ground every year; when the roots are taken up, they are exposed to the sun to dry and beaten to remove the earth, they are then packed in sacks.”

With reference to the above, I may add that in France a crop is often reaped within eighteen months without injury to quality; the quantity being only smaller, and it would appear from details published in M'Culloch's Dictionary of Commerce, page 771, that where soil is impregnated with alkaline matter the root acquires a red colour, which is esteemed the most in France; whereas in other cases, the root is yellow which latter is preferred in England. The annual consumption of Great Britain is about 50,000 cwt. of madder, i. e. the roots

pounded, sifted and dried, and of madder roots nearly as much. The price (including duty of two shillings per cwt. on madder, and 6d per cwt. roots) was in 1834, as follows :—

Prepared madder from 16s. to £3 18 0

Roots per cwt. ... £1 16s. to £2 16 0

It might be advisable to distribute the present supply of seed in Purneah or in the neighbourhood of Nepal, where a species of madder or *rabia tinctorum* is cultivated, i. e. the munjeet of commerce. A further supply of seed I can furnish if required.

I am,

Your obedient servant,

GEO. F. HODGKINSON.

Calcutta, 10th November, 1835.

Notes on Indian Agriculture, as practised in the Western or Bombay Provinces of India ; By ALEXANDER GIBSON, Esq., Superintendent of the Botanic Garden at Daporee.

I do not offer these notes for perusal in the idea that they communicate any thing very new, neither do I suppose that from their contents can be elicited any thing likely to be of solid benefit to the more enlightened agriculturist of Great Britain; 'as little do I fancy that they can possess even a tithe of the interest which must attach to a detailed description of the careful cultivation practised by the industrious Chinese husbandman. Still, I deem it possible, that they may in some points not be destitute of interest :

1st. As showing that the agriculture of India is not altogether of so rude or slovenly a character as it is often supposed to be.

2nd. That many of the means and instruments used, albeit simple, are yet well adapted to attain the end in view.

3rd. That much of what is bad in the husbandry of India, is owing rather to the faulty framework of the social system of the Hindûs, than to any natural want of acuteness.

4th. That until the habits of the people as regards their social system, be in some measure changed, little or no alteration in the present routine of practice is to be looked for.

The remarks which have led me to form the above general conclusions, will be found scattered among the details given hereafter. Having premised thus much, I will proceed to notice separately the modes of cultivation of the various Cereal Grains, Legumes, Oil-plants, &c., in common use.

1st, *Wheat*.—Is grown chiefly above the Ghâts in the Dekkan, Kandesh, and the Carnatic; also most extensively in Gujarat, even to the sea border. Farther south, the climate and soil under the Ghâts, do not admit of its being grown. It is also extensively raised in many level table-lands met with before the Ghâts soften down to the flatter plains, and on such high levels, the same measure of grain is found to weigh about one-quarter more than a similar quantity raised in the more plain country.

Wheat is universally sown as a crop of the cold season. The land intended for it, however, receives its first preparation either in November or December of the previous year, or after the first rains in May of the year in which it is to be grown. In Gujarat, this preparation consists in ploughing three or four times with the two bullock plough. A deeper-going instrument is deemed prejudicial as bringing up an inferior sub-soil. In the Dekkan, the land is most generally prepared with the six bullock plough, while in the more southern districts, bordering on and in the Carnatic, a plough of from twelve to sixteen bullocks is in general use, but is not had recourse to in the same land till after a period of twelve years; and often besides a ploughing with the great plough, the land has to be hand-dug to root out the *Haryâli* grass, so destructive to crops.

The land having been thoroughly broken up and cleared of grass-roots by ploughing, digging and hand-picking, is left to be beaten down by the action of the rainy weather. In September it again undergoes a slight preparation by the knife-harrow, *koolas*, (*kulava*?) and on the weather being deemed favourable, the seed is sown by the simple drill harrow of hollow bamboos, converging upwardly into a cup, and spreading below, so as to allow of the lower extremity of each being inserted into a thick and hollow harrow tooth tipped with iron. Rain falling after germination is deemed to lessen the value of the crop, but a few heavy showers after it has attained the height of three inches materially assist its growth. The reason of the idea is sound and apparent.

The land best fitted for this growth is the strong black soil, which may be called our oldest alluvial, dating probably from the period when the world was a mass of lakes; hence, where this black soil is found in greatest quantity, the country is a perfect level. In the best tracts of such soil no artificial manure is ever required. The soil itself seems, owing to the predominance of calcareous matter in a state of very minute division, to have the property of converting every leaf-blade and stick which falls, into a substance identical with itself, in a

very short space of time. This may be one reason why manure is not required.

Rotation is certainly necessary and universally practised, but not always until two or three crops in succession have been taken from the ground. Wheat is esteemed a very exhausting crop, or as the natives say, "its roots are foolish." A person attempting to take a crop of sugar-cane after wheat, even supposing that he manures largely, is sure to fail. This I have more than once had occasion to see.

In the best black soils, the power of retaining moisture is so great, that a wheat crop sown, will without the aid of any after-showers, but simply by the retained moisture and the action of cold air, turn out full. The rationale of this action of the cold I have not heard explained, but the fact as to its materially aiding in the growth of wheat and other grain is universally admitted. Should rain fall after the ear has begun to fill, the effect is most prejudicial, nay, even the prevalence of a southerly wind, which brings with it the moisture of the sea, is hardly less so. The effect of either of these is to produce a red smut with mildew of the ear, so that in an extent of many acres not one hundred pounds of grain may be reaped.

In some seasons, also, rats are epidemically destructive. For instance, in 1834-5, I recollect that in some districts large remissions of revenue had to be given on this account. The wheat once sown requires no farther care until the reaping season. It is then pulled, bundled, and the shares of the village establishment having been duly paid to them, the remainder is trodden out on the threshing floor. The chaff is carefully set apart as a most necessary provision for bullocks, and stored until the season when other provender is scarce, I believe, that but for this chaff, the cultivation of wheat would be by no means so extensive as it is, for the grain is not so certain a crop as some other crops are. It is also a necessary part of rotation.

Of varieties of wheat which I have seen grown in India, the number is six. Of these may be first mentioned, Bakhshi also called Daood Khani, in allusion, doubtless, to its northern origin; these two are very nearly related if not identical; both give a superior flour, best fitted for white bread, sweetmeats, &c.; the first is always raised on irrigated land; the second is a dry crop fitted only for the best soil. I find that the produce does not generally exceed twelve hundred pounds per acre, and is most frequently short of this quantity; the price at which these wheats sell is higher than that of other wheats; but it varies according to situation, season, &c., from sixty pounds to

ninety pounds per rupee, *i. e.*, it may be said to vary from ten to sixteen shillings per quarter. In Gujarat, however, the produce may be larger than that above-mentioned.

The tax on an acre of the best wheat ground, may in Gujarat amount to eight or ten shillings. In the Dekkan and Carnatic border, the rate of such ground, per acre, will probably vary from two to five shillings under the new survey. Each acre of wheat will, in addition to the grain produce, be expected to yield chaff to the value of two rupees.

The other varieties of wheat are,—

2nd, Kathí. Inferior to the last in colour and quality, but rather superior in quantity of produce.

3rd, Pothí, Inferior to the last, but suited to poorer and even to red soil if manured.

4th, Kowrí or Khapale, Do. Do.

5th, Tambari. Inferior to all of the above.

6th, Beardless wheat. Not common here, but grain fine. Said to be common at Delhi.

The tax on the land whereon it is raised may not exceed one and sixpence or two shillings.

As to the storing of the crop, this in a tropical climate, where animals of every description abound, is a most essential part of rural economy. The granaries are always underground pits, excavated in sloping places, or places where the sub-soil is hard and dry; these pits are from six to eight feet in depth, closing to a narrow mouth; and having the bottom well puddled with clay, and the sides lined with thick ropes made of the leaves of sugar-cane, or other dry material, twisted; over these, teak or any other large leaves are carefully built as the filling proceeds; and the mouth is closed by grass beaten down and puddled over with earth. The leaves of the Ním-tree are usually put in along with the grain, as they from their bitter quality, have some power in warding off attacks of the weevil or other insects.

In countries where dry grain is much grown, the number of these subterranean receptacles is so great, that an elephant driver will most reluctantly and carefully pilot his animal through the quarter of a city where the grain shops are, from the fear of the hollow ground giving way under the elephant's weight. In a year of scarcity (and fortunately these are becoming less and less common under our Government,) the value of such receptacles is fully felt.

At present prices, a quantity of wheaten flour sufficient for a meal for two natives, may be purchased for about one penny, and as the

wages of labour on this side of India, rule at from four to eight shillings per month, it will be obvious that the number of persons who can afford to feed on wheaten flour, is large. The greater proportion, however of the labouring population seem to prefer as a food, the cereal next mentioned.

BAJRI (*Holcus spicat.*)—This grain is a staple of first importance as an article of food for the working classes, and, indeed, many of the higher ranks, especially Mahrattas, prefer Bajri to wheaten bread. It is generally believed to be the best food for a man who has to labour hard.

It is grown extensively in Gujarat, the Dekkan, and Kandesh. It does not flourish below the Ghats southward, neither does it appear to be grown in the Carnatic provinces. The soil which best suits it is a brown mould, partly composed of red and partly of black soil; though this be its most choice habitat, it will be found growing in all the coarser varieties of soil up to the merest detritus of trap rock, forming the lower shelves of hills. In the sandy soils forming the borders of the Northern Desert or Run, it will be found growing luxuriantly.

Bajri land is generally ploughed and turned up as soon as possible after November; it is then ploughed and cross-ploughed, and allowed to benefit as much as possible by the action of the sun in the hot weather; after the first heavy rain of June, and from that time until the 20th of July, the final preparation is given by the knife-harrow twice run over the land. Weeds are carefully collected, heaped, and burned in the land, and manure, if procurable, is then spread. The grain is now sown with the common drill sowing machine, and the ground is then smoothed down by the drill machine inverted, and kept down by the weight of one or more men.

When the crop has reached the height of four or five inches, weeds and grass are removed, and the plants are clustered up by a light bullock hoe, composed of two pairs of horizontal iron brackets fixed in frames, and at such distance as to sweep the edges of each drill, removing weeds in their progress, and also loosening and turning up the earth before them. The cost of a pair of such hoes may be about one shilling; they are very effectual for the purpose intended.

From this time until the grain has eared no farther care is requisite; should timely showers, usually looked for in August, fall, the crop will probably be abundant; but even should these fail at the appointed season, the plant is very tolerant of long drought; much rain is injurious, particularly in the shallower and sloping soils; in these, the

under stratum being nearly impermeable to water, this is accumulated about the roots of the plants and speedily rots them, especially when no manure has been given. In parts of the same field, the manured portion may often be seen to retain a dark and healthy green hue, while the unmanured portions are of a sickly and dying yellow. The grain having been formed, the next care is to preserve it from birds, such as sparrows, parrots, &c. These animals are most destructive, particularly if trees happen to be situated near to the field: when this is the case, it must be watched from sunrise to sunset, and for this purpose members of the peasant's family relieve each other on a stage erected in the field, and with cries, slings and stones, keep the birds at bay. The grain having ripened, it is stacked to await the peasant's leisure for threshing.

In threshing, the heads are first separated from the stems; this is performed by women, who, if hired, are paid at the rate of six pounds and a half of grain per one hundred bundles or sheaves of the straw thus separated. It has often occurred to me that a small and simple machine, like the model of a loaded guillotine, might be made efficient in chopping off the heads of grain. The chief obstacle to this, would consist in the different lengths of the straws composing a bundle; a machine of this kind would save a vast quantity of manual labour.

The produce of an average crop per acre, will be found to be about six hundred pounds; but in rich districts, such as Gujarat, one thousand pounds will be nearer the quantity.

The straw is in many districts the only resource of the peasant for cattle-forage, and therefore is most carefully stored, but it is very inferior in nutriment to the straw of millet, or Jowari. The amount of straw per acre may be about six hundred bundles, value about one rupee ten annas, or three shillings.

As to the price of the grain itself, I conclude that the ryot can seldom, except in Gujarat, realise a gross product of more than four rupees per acre, and on poor unmanured watery, or rocky lands, about two rupees per acre.

The tax on land fit for Bajri, may be in Gujarat from two to four rupees per acre; in the Dekkan, &c., at least under the new survey, I believe, that one rupee eight annas may be the maximum, and six annas the minimum, giving an average of fourteen annas; the chaff of this grain is not eaten by cattle.

In the poorer soils along with Bajri, is always sown a small Legume (*Hoolga, hallowla*);* this is hardly in flower when the Bajri is taken

* Mahrati, Hulagá or hulagi: *Dolichos biflorus*.—Editor.

off; it is left to ripen and may give about one and a half maunds per acre.

In the richer soils, Tur (*Cytisus bajari*), is commonly sown in the alternate rows, and is also left to ripen after the crop of Bajri is taken off.

The selling price of Bajri in the inland districts can be hardly quoted as higher than one hundred and fifty pounds per rupee; since the abolition of transit duties it has been exported to the coast districts in much larger quantities than was formerly the case, and this has had some tendency to equalise prices. It is reckoned as a very sanatory rotation crop; it is also subject to fewer casualties than are most of other cereal grains. Alone it is not given to horses, being esteemed too heating, but mixed with math (*Phaseolus aconitifolius*), it forms an excellent food.

GREAT MILLET (*Holcus sorghum*). **MILLET** is a grain very extensively cultivated in this Presidency, throughout Gujarat, Kandesh, the Dekkan, and Carnatic, but in the narrow strip of coast composing the two Conkans, it is not suited to climate or soil, and consequently is never raised. In the rich black plains of Gujarat or Kandesh it may often, indeed most generally, be seen twelve feet high; in these black soil districts it is the established rotation crop for cotton and wheat.

The first variety, or red Jowari, is sown immediately after the first fall of rain in June. The land requires little preparation, as it had been in former seasons either prepared by trenching or by ploughing, and freed from all weeds; thus, the only farther preparation necessary in sowing Jowari is to run the knife-harrow several times over it, and afterwards to sow with the drill machine before-mentioned. The plant is afterwards earthed up or weeded with the bullock hoe; watching is required as in the case of Bajri, and unless done by the peasant's family, constitutes a considerable item of the expense of the crop; it ripens in October, and is pulled, stacked, and the ear afterwards separated by manual labour.

The second variety, or White Millet, is sown in the end of August or beginning of September; this is a much lower growing grain than the first, but the ear is greatly larger, fuller, and both grain and straw are superior. The straw of this last contains much saccharine matter, and is wholly consumed in forage; whereas, of the first only the leaves and tender ends are eatable, while the entire stem is rejected by beasts. In quantity of grain this cereal is most productive, two thousand five hundred pounds per acre being a common crop in good soil.

The growth of the second variety is confined to the more inland and open country, particularly to those districts, which from their situation, get showers in October or November, the commencing showers of the Madras monsoon. It is a crop which bears a good deal of wet without injury to the straw, particularly when manure is used; cold has a beneficial action on the filling of the ear, but the least excess of it kills the plant, and this blight takes place chiefly in situations near a running stream, where the cold is a degree or two greater than that of the surrounding country. Should frost occur, which is sometimes the case, whole fields are immediately dried up. It is a beneficent provision of nature that the straw of this grain should most abound in the black soil districts in which cotton is raised, and which are generally destitute of pasture ground.

For the transport of an article so bulky as cotton, large numbers of bullocks are required; the Jowari straw can be afforded at a rate so cheap, as to be accessible to the poorest; the price varies according to situation, season, &c., from four to fifteen rupees per thousand bundles, and the size of these may be judged of by the fact that ten of them form a load for a man. The straw, particularly of the second variety, is very nutritive; it is carefully stored up as a resource in case of a bad season. In Gujarat it is stored in houses; in the Dekkan and Carnatic, I remark that it is preserved simply by overlaying the sloping stacks with clods of the black soil; these are beaten down by the rain into a uniform mass, which forms a hard crust over the stack. This straw is the principal food for elephants and camels in countries where trees and shrubs are scarce.

This cereal is often sown solely for the sake of the straw; this is done in districts where other pasturage is scarce, but where the means of irrigation are abundant; when sown for this purpose, sowing takes place in March, in ground well manured; it is sown very thick, as length of straw and not weight of ear is the object. It ought to be fit to begin cutting by May 15th, and a careful husbandman calculates on having a supply sufficient for his bullocks until the first rank grass of the rains gathers some heart and is fit for food; it is cut green, and the quantity required for daily consumption is cut, and the remainder left standing. In seasons when from deficiency of the early rain forage is scarce, this straw can often be sold standing, at the rate of about fifty rupees per acre.

In a poor country, such as that which forms a large portion of our Dekkan province, where there is almost always an under supply of forage, every fair means should be taken to encourage the extension of

a cultivation so essential for the preservation of animals as this. It is therefore with sorrow, I remark, that under the new survey now in progress, a tax on wells, even of the most common description, is being re-imposed. Since the total abolition of well tax in the Poonah zilla which took place about seventeen years ago, the ryots have exerted themselves in vastly multiplying the means of irrigation. We may now look for a complete check to this spirit, and it seems too probable, that even many wells now in use will be thrown up.

The selling price of millet may be quoted as varying from one hundred and forty to one hundred and seventy pounds per rupee. It seems to form the principal food of the inhabitants of large cities, artisans, weavers, and others whose employments are sedentary. A quantity sufficient for two meals may be purchased for about a half-penny.

The roots of the crop of a previous season are thrown into embankments to help in binding together the soil. Every good cultivator constructs such embankments when the soil of his field is at all sloping, and consequently liable to be washed away. Sometimes they are done by the labour of his own household, but more generally under contract with widadars, a class who travel about the country performing work of this kind.

ELEUSINE CORACANA (*Natcheny, nágali, maud*).—Cultivated principally as a hill grain, but also in the plains. *E. stricta* is the species cultivated in the latter; it is not an article of general culture, but only in garden villages, near and below the Gháts, where soil is alluvial, and stream water abundant.

The young plants are raised in a bed formed by ash manure; on the ground being thoroughly moistened, which it ought to be by the 10th July, the young plants are taken out and puddled down in the adjacent fields previously prepared by a light plough and harrow. The increase of this grain is very great, in good soil about three thousand pounds per acre; it is a cheap grain; its price may be quoted at from one hundred and fifty to one hundred and ninety pounds per rupee. I believe that the Banyans often refuse it as a return for cash borrowed, a proof of the small value attached to it in proportion to its bulk.

The hill species, *E. coracana*, is a smaller plant and much less productive; it is planted out in July. As the mode of its cultivation is identical with that pursued with the other hill grains (one excepted,) one description may serve for all.

A piece of jungle is cleared of bushes or trees in any of the dry months; the bushes, leaves, and wood, are thickly spread so as to

cover the ground intended for the plants; fire is applied in April or May; with the first rainfall seed is sown broadcast. When the plants are sufficiently high, advantage is taken of wet weather to scratch the adjoining ground into furrows, either by hand or a light plough, a person follows in the furrows with a basket of the plants, which are simply dropped in, and left to be brought on by the rain acting on the loose soil. No farther care is required, and reaping takes place in October or November.

On account of the broken nature of the ground it is impossible to estimate accurately the quantity of grain obtained from a given portion of soil, but it is certainly less by three-quarters than that obtained from the garden species above alluded to.

Land thus treated is cultivated for four years in the following rotation.

1st. *Elusine Cor.*, Natcheny.

2nd. Wari, or Kang, (Kangni?) *Panicum Miliare*, and *P. Itolicum*.

3rd. Harik, Kodroo, (Kadrava,) *Paspalum scrobiculatum*.

4th. Verbesina, Black Til, an oil plant.

These four crops are considered to exhaust the soil, which is left in fallow for twelve years. The straw of Natcheny is indispensable to the Ghât peasant and the Concan cultivator, as a food for their cattle. In those countries the grass, either from the nature of the climate, or the late period at which it is cut, contains little or no nutriment, and cattle fed on it could not labour for any time. The sale of the spare straw is one of the resources of the peasant, and it is largely purchased by the Lingayet and other travelling grain dealers, whose cattle are generally in good condition. The Banjaras again, or Lumans, make no provision of the kind for their cattle, and the consequence is, that of those who come down for salt late in the season immense numbers die.

The straw of the *E. natcheny* is also used for burning bricks when it is intended that these should be large, or of choice quality; it is chopped up and mixed with the brick clay; the effect, of course, is the thorough baking of the brick. The large bricks to be met with in all old buildings of the Mussulman princes of India have been prepared in this way, so that the children of Israel had reason for grumbling in that they were compelled by Pharaoh to make bricks without straw. (*Vide* Exod. Chap. v.)

As the roots are many, the grain is thrown on embankments in order that the plant, as it grows, may bind together the earth and stones.

OTHER HILL CEREALIA.—Of these it may be said generally, that the mode of cultivation is as in that last described; that the produce is quite as cheap or cheaper, and is seldom used as food beyond the districts where it is produced. The patch of rice is chiefly looked to as a mean of paying the land-tax, and the cultivator is fortunate if he has a sufficiency of the other grains to last until the following October.

I remark, that this season locusts appear to have alighted only in villages close to the Ghâts, or in the Ghâts, and in many of these the crops have been so completely eaten up, that the villagers have already begun to feed on the stems of the wild plantain-tree, the wild yam, and the more delicate but rarer root of an undescribed umbelliferous plant named "Peenda."

Before concluding, I will advert to the remarkable intoxicating property found in one of these grains, Harik, a *Paspalum* (frumentaceum?) I have had occasion to see a large number of inhabitants of a village simultaneously affected with intoxication, after a meal made from cakes of this flour. Vertigo, a degree of sleepiness and fatuity, rather than active excitement, is the characteristic effect of this grain. The symptoms are sometimes of a character more severe, lasting for seven days and attended with a vomiting of blood; fatal cases it is said sometimes happen, but I have not any case well authenticated; the effect from the grain eaten is not constant. It is most apt to occur when the grain has attained full development owing to late and heavy rain, acting on a highly manured soil.

Its intoxicating property is said to be neutralised by previous steeping in water wherein cow dung has been diffused.

The remedies had recourse to after the effects have taken place are, 1st, A pottage composed of the flour of "Borud," (*Phaseolus mungo*); and 2nd, expressed juice of leaves of "Harsinga," (*Nyctanthes arbor tristis*.)

The action of this grain on the human system is well worthy further investigation. [*Journal of the Royal Asiatic Society of Great Britain and Ireland*, No. xv.]

FURTHER NOTICES REGARDING MADDER.

(From Ure's Dictionary of Arts, Manufactures &c.)

In a Memoir published by the Society of Malhâusen, in September 1835, some interesting experiments upon the growth of madders in factitious soils are related by M. M. Kœchlin, Persoz, and Schlumberger. A patch of ground was prepared containing from 50 to 80 per cent of chalky matter, and nearly one fifth of its bulk of good horse dung. Slips of Alsace and Avignon madders were planted in March, 1834, and a part of the roots were reaped in November following. These roots, though of only six months growth, produced tolerably fast dyes, nor was any difference observable between the Alsace and the Avignon species, whilst similiar slips or cuttings planted in a natural non-calcareous soil, alongside of the others, yielded roots which gave fugitive dyes. Others were planted in the soil of Palud transported from Avignon, which contained more than 90 per cent of carbonate of lime, and they produced roots that gave still faster dyes than the preceding. Three years are requisite to give full calcareous impregnation to the indigenons madders of Avignon.

As to the function of the chalk, valuable observations made long ago by M. Daniel Kœchlin, have convinced him that the combination of two different bases with a colouring matter gave much more solidity to the dye, in consequence undoubtedly, of a greater insolubility in the compound. Experiments recently made by him and his colleagues above named, prove that in all cases of madder dyeing under the influence of chalk, a certain quantity of lime becomes added to the aluminous mordant. In the subsequent clearing with a soap bath, some of the alumine is removed, and there remains upon the fibre of the cloth a combination of these two earths in atomic proportions. Thus the chalk is not for the purpose of saturating the acid, as had been supposed, but of forming a definite compound with alumina, and probably also with the fatty bodies, and the colouring matter itself.

From M'Culloch's Dictionary of Commerce

In France, madder is prepared nearly in the same manner as in Zealand. The following instructive details as to its cultivation, &c. in Provence, were obligingly furnished to us by an English gentleman intimately acquainted with such subjects, who visited Avignon in the autumn of 1829:

"This town (Avignon) is the centre of the madder country, the cultivation of which was introduced here about the middle of the 18th

century, and with the exception of Alsace, is still confined (in France) to this department (Vaucluse.) The soil appears to be better adapted for its cultivation here than any where else, and it has long been the source of great wealth to the cultivators. Of late years, however, the prices have fluctuated so much, that many proprietors have abandoned, or only occasionally cultivated this root, so that the crop, which was formerly estimated to average 500,000 quintals, is now supposed not to exceed from 300,000 to 400,000.

“The root is called *alixari*, and the powder (made from it) *garance*. The plant is raised from seed, and requires three years to come to maturity. It is, however, often pulled in 18 months without injury to the quality; the quantity only is smaller. A rich soil is necessary for its successful cultivation, and when the soil is impregnated with alkaline matter, the root acquires a red color, in other cases it is yellow. The latter is preferred in England, from the long habit of using Dutch madder which is of this color, but in France the red sells at two fr. per quintal higher, being used for the Turkey red dye.”

(From *Library of Entertaining Knowledge; Vegetable Substances.*)

Vegetable substances yielding red colouring matter are not very numerous, none of them affording substantive dyes. Among them madder ranks the first in importance. The colouring matter resides chiefly in the roots, and it is this part alone which is employed.

The Madder plant grows naturally in the Levant, in Italy, in the southern parts of France, and in Switzerland. It is much cultivated in Holland, but Macquer observes that the Dutch were first indebted to the Flemish refugees for their knowledge of the method of preparing this plant. Its culture has often been attempted in England, but always without success.

It will live in any soil, but will not yield in every situation an equally fine produce. Dry ground is not favourable to its growth, but it dies if it is flooded. It succeeds best in a moderately rich, soft, and somewhat sandy soil. The root is perennial, having an annual stalk, and is composed of many long thick succulent fibres, about a quarter of an inch in thickness. It is joined at the top in a head like asparagus, and runs very deep into the ground. Many side roots issue from the upper part or head of the parent root, and they extend just beneath the surface of the ground to a considerable distance. It in consequence propagates itself very rapidly, for these numerous side roots send forth many shoots, which, if carefully separated in the spring soon after they are above ground, become so many plants. These roots are covered

with a black bark or rind, divested of this they are of a reddish colour and semi-transparent; a yellowish pith is found in the middle, which is tough and rather of a bitter taste. The whole has a strong and peculiar smell. From the roots spring forth many large square-jointed stalks; these are weak and unable to sustain their own weight; they rise in good land to the height of eight feet, but if not propped, they creep along the ground. They are armed with short herbaceous prickles, and round each joint are placed in a whorl six or eight spear-shaped leaves of about three inches in length, and in the broadest part almost an inch wide. The upper surface of these is smooth, but the mid-rib on the under side is armed with rough herbaceous spines. The branches which sustain the flowers proceed from the joints; they are placed by pairs opposite to each other, having a few small leaves growing in triplets towards the bottom and in pairs as they approach the top. These branches are terminated by loose branchy spikes of yellow flowers, which are cut into four parts, and resemble stars.

The madder plant does not bear flowers until the second or third year, when they bloom in June and are succeeded by berries which contain the seeds. It is propagated by shoots. In the beginning of August the land is ploughed in ridges, eighteen inches asunder, and a foot deep; the young plants are placed in these a foot apart from each other. They thus remain for two seasons, care being taken to clear them of weeds. At the latter end of September, when the leaves are fallen off, the roots are taken up and dried for market.

According to an experiment made near Tours, an arpent (48,000 square French feet) of ground produced eight thousand pounds weight of fresh roots of madder; but in general not more than four, five or six thousand pounds are expected from the same space.*

As soon as the roots are dug up, they are taken to a place of shelter, so as to admit the air freely from all sides.

The French distinguish two qualities of madder, that which is prepared from the parent root, and that from the side shoots; the first, when the roots are not too large, is considered the best. These two descriptions of root are kept separate in the dryinghouse, where they are left for four or five days, being turned once or twice during that time, in order that they may dry equally, and that the earth adhering to them may be rubbed off. They are then conveyed to kilns constructed for the purpose, where they are still farther dried. When the roots are sufficiently dried outwardly they are removed to a floor made as clean as possible, and the outer skin is then separated by means of thrashing.

* *Elemens d'Agriculture*, par M. Du Hamel.

This skin is pulverized by itself and packed up in separate casks. It is known in commerce by the name of *mull*, and being extremely inferior to the other part, is sold at a comparatively very low price.

After the outer skin is thus separated, the roots are again conveyed to the kiln and subjected to a greater degree of heat than before. That this heat may not be injurious to the roots, they are frequently turned and a current of fresh air is blown through the kiln, to carry off the noxious exhalations of the plant, which would otherwise injure the colour. When the roots are sufficiently dried, they are conveyed to the pounding house to be reduced to powder.

In warm climates madder is prepared without the application of artificial heat. It results from this difference of preparation, and perhaps also from the variety of the plant, that two kinds of madder are distinguished, which differ in their dyeing properties.*

The roots are ground either between mill-stones or under knives similar to those of a tan-bark-mill. After the first milling the impurities are separated by means of boulders or fanners. In this state it is so partially cleansed that the French call it *non-robée*,—the residuum consists of earthy matter, epidermis, and bark.

After a second milling what is separated is called *mi-robée*, and finally, after a third milling, the madder *robée* (signifying cleansed from the husk) is obtained, and which is of the best quality. This substance is employed as a red dye, and also as a first tint for several other colours. The madder used for dyeing cotton in the East Indies is in some respects different from that of Europe. On the coast of Coromandel it has the name of *chat*. It grows wild on the coast of Malabar; the cultivated kind is obtained from Vaour and Tuccoun, but the most esteemed is the Persian *chat*, called also *dumas*.

The madder imported in considerable quantities from Smyrna is more esteemed than the best Dutch madder, which ranks the first of that grown in Europe. The madder produced in the lower part of the Rhine is considered by Berthollet as not inferior to that of Zealand.

This is an adjective dye, but affords a permanent colour to cloth which a few days previously has been boiled for two or three hours in a solution of alum and tartar. The colour which it imparts is not so beautiful as that obtained from kermes or cochineal, but being much less expensive, it is extensively employed for common stuffs. Linen takes this dye with more difficulty than cotton. It is seldom used for silk, but is one of the most valuable dyeing drugs for a variety of purposes. It is an agent for dyeing many colours, and is therefore peculiarly adapted

* Berthollet.

to the process of calico-printing, since by the use of different mordants, a variety of hues may be produced by immersion in the madder bath. One mordant in combining with it, precipitates the colouring matter red, another purple, another black, and so of every possible shade from lilac to black, and from pink to deep red. If a portion of weld or quercitron be added to the madder, every shade from brown to orange may be produced.* Tin, iron, and aluminous bases, as well as other mordants, are used for this purpose, dependent on the colour required.

It is a matter of doubt and speculation with chemists whether these various colours are produced by the combination of the colouring principle of madder with the different mordants, by which a chemical change takes place, or whether several colouring matters are not really contained in the substance itself, and severally precipitated or retained by the varying action of the different agents to which it may be subjected. It is, however, certain that it contains at least two distinct colouring matters, a fawn and a red, and that the admixture of the former with the latter very much injures its clearness and beauty. In consequence of this, two kinds of red are obtained from madder. The first is simply called madder red, which contains the whole of the colouring matter. The other possesses far more lustre, and is much more valued; it is called Turkey red, because first obtained from the Levant. Its superior brilliancy is imparted in consequence of the red colouring matter being alone preserved; and while the tint communicated excels in brightness, it has the additional and great advantage of extreme durability.

The manner of producing this desirable effect was for a long period of time a subject of much interest and inquiry, the process used in Turkey being enveloped in mystery. The industry of the French artisans was stimulated by the interest which their government took in the discovery. Yet attempts at imitating this beautiful dye were long fruitless, and when at length they proved successful, this success was limited to one or two dye-houses. It was only by very slow degrees that it became more diffused, and then each individual who acquired the knowledge jealously guarded his own peculiar secrets, which he had introduced in the process.

At length the Abbé Mazeas published the result of his experiments on the subject; and in the year 1765 the French government promulgated all the information which had by its direction been diligently collected. These instructions were entitled 'A Memoir containing the process for the incarnate red dye of Adrianople on cotton yarn.' Ber-

* Parkes' Chemical Essays.

thollet, Vitalis, and other eminent chemists, have likewise subsequently given an account of the course of procedure. All nearly agree in the detail, whence it appears that the process is most elaborate and tedious. Many different ingredients are used previously to applying the madder. Oil, sheep's dung, calf's blood, gall-nuts, soda, alum, and subsequently a solution of tin are employed, and the yarn undergoes seventeen distinct operations before it is finally imbued with its rich colouring. Many of these materials are considered by Dr. Ure as unnecessary, and his opinion has received the confirmation of an eminent calico-printer, who assured him that oil and alumina are the only essential mordants in the process.*

It is said that a dilute super-sulphate of potass is now used with success in France for separating the two colouring matters.

It was not until the year 1790 that the art of dyeing the Turkey red was introduced into our country. At that time M. Papillon, a Frenchman, formed an establishment at Glasgow for carrying on the process. He obtained a premium from the commissioners and trustees for manufactures in Scotland, on the condition of communicating his secret to Dr. Black; it being stipulated on the Doctor's part that it should not be divulged for a certain term of years, during which period M. Papillon was to have the sole use of, and the benefit accruing from his process. The term being expired, the process pursued was published, and found to be very similar to that already given by the French chemists.

Another species of madder has been cultivated in France by M. D'Ambourney, who found it growing wild among the rocks of Oissel in Normandy. On trial it yielded a dye as beautiful as that of Smyrna madder, and he was therefore induced to prosecute its culture. This plant is rather different from the madder grown in Holland. Its roots are more slender and of a less bright colour. They are furnished with few fibres at their joints, and those joints are farther apart; the stalk is not so thick, and the leaves are narrower and of a paler green.

In consequence of the impossibility of drying his roots without fire, M. D'Ambourney was induced to use them fresh after being well washed and cleansed. It is estimated that the root of the madder loses seven-eighths of its weight when dried and reduced to powder. But four pounds of the fresh root were found to be as efficacious as one pound of pulverized madder; therefore, by this plan, twice as much effective colouring matter was obtained & besides which advantage there were many others,—the expense of erecting sheds and kilns for drying

* Note to Berthollet's Elements of the Art of Dyeing, translated by Dr. Ure.

was rendered unnecessary—there was no danger of injuring the substance by improper drying, nor was the cost of a mill for grinding required. Lastly, the roots did not evaporate or ferment, as in the case with powdered madder if not speedily used; but they might be preserved fresh during several months, by laying them in a hole three feet deep, in alternate layers of roots and of earth.* Roots are now imported in large quantities into England, and obtain a proportionate higher price than the prepared madder.

In 1804 the gold medal of the Society for the Encouragement of Arts, &c. was voted to Sir H. C. Englefield, for his discovery of a pigment prepared from madder. He obtained a fine lake by many different processes, and found that the colour produced from the Smyrna was of a deeper and richer tint than any prepared from the Dutch madder. In pursuing his experiments he discovered that the colouring matter might be extracted from fresh madder, and thus not only all the expenses and difficulty attendant on the process for prepared madder might be avoided, but the cost of carriage would be one-fourth less than for the roots: while separated from these the colouring matter might be kept for any length of time without danger of being spoiled. A further advantage would also arise in the quantity obtained, as all the colouring matter could be extracted; while in the manner which the dyers use the roots, a very considerable part of the colour is left in the refuse matter, and consequently wasted.

The following is a slight sketch of the method proposed for obtaining this extract. A given quantity of the roots ground into a pulp is put into a woollen bag. This is then triturated in large vats filled with a certain relative proportion of water; the friction is continued until the colouring matter is entirely washed out of the madder; the water thus loaded with colour is boiled,—an iron vessel must not be used, as a chemical change would take place and the colour would be spoiled. After being boiled it is poured into an earthen receiver, and a solution of alum is mixed with it in given quantities. Then a certain proportion of a saturated solution of mild vegetable alkali is added, which causes effervescence, and the colouring matter is immediately precipitated, from which the supernatant liquor being drawn off, the colour is readily dried for use.

The colouring matter of this plant has a very remarkable affinity to the bones of animals, those eating of the root having their bones dyed of a red colour. This fact was long known to the practical dyer; but as it did not fall in with any of his pursuits, it excited no interest and

* M. Du Hamel.

was disregarded by him, or taken as a matter of course. In the present day, perhaps, this class of persons are somewhat more enlightened, and their minds are not wholly chained down to the immediate objects of their particular avocation.

The average annual importation of prepared madder in England for the last five years from 1828 to 1832 is 67,525 cwts. Of madder roots 46,272 cwts. The former pays a duty of 2s. per cwt.; the latter only 6d. for the same quantity. The average price of the best madder for the five preceding years was 83s. per cwt., and of the best roots 48s. per cwt. It is imported from Holland, France, and Turkey.

Correspondence and Selections.

Correspondence relative to the valuable properties of the American Sumach, or Dividivi, (Cæsalpinia Coriaria) as a tanning plant. Communicated by DR. WALLICH.

J. HUME, Esq. *Honorary Secretary, Agri-Horticultural Society.*

MY DEAR HUME,—I am now in a position to furnish you with very satisfactory information concerning the American Sumach.

Enclosed I have the pleasure to send you extracts of two letters from Mr. Teil, dated 6th and 10th instant, and copy of a third letter from that gentleman, received yesterday, dated the 27th; I also send you one-fourth of the beautiful skin which accompanied the last communication from Mr. Teil.

I look upon the information contained in the above several letters from Mr. Teil, as highly interesting and satisfactory; and I doubt not that the Agricultural Society will take a similar view of the matter. The result of the trial that has been made, as far at least as concerns the quality of the accompanying skin, seems to leave nothing further to be wished.

The American Sumach deserves to be extensively cultivated in this country. It seems to thrive remarkably well, requiring very little, if any care, except in its youngest state; and a proportionally small expenditure of money. The tree seems to be contented with a very ordinary sort of soil, and in all probability, when once reared from seeds ripened in the country, it will be as productive as in its own native climate, at least sufficiently productive to make the cultivation of the tree an object of importance.

How far the Dividivi may answer as a Mordant, remains to be seen. Mr. Teil thinks that it will prove admirably adapted for that purpose.

In my first note to you on the American Sumach, of the 21st ultimo,* I referred you to the interesting extracts contained in the 3rd Volume of the Society's Transactions, pp. 83 and 93 (reprinted in Madras Journal for April 1837.) You will find that the 10th Volume of the Gardener's Magazine (for 1834) page 404, is quoted as containing further valuable information.

The tree was introduced by Dr. Hamilton at Plymouth into this garden. Our first plants were raised in December, 1835. The first flowers were produced in November, 1837. In November, 1840, the plants blossomed freely, and furnished some ripe pods. During this present and last month, we have had about twelve seers weight of pods; and I am quite sure we shall have a larger supply next year. I suspect our trees have been shaded too much—have been too much taken care of.

Again and again, I recommend this Sumach to be widely cultivated in this part of the world. I have sent seeds to Madras, Ceylon, and Bombay, and to many places in Hindustan.† Enclosed I forward to you an additional paper of the seeds.

There is a subject, which I may as well mention here. Five or six years ago I had some correspondence with a French gentleman, who insisted that a cargo of Dividivi had been imported into France from Chandernagore. He produced a sample of the drug, which at once satisfied me that it was genuine, and no mistake. But since it is equally certain, that this Dividivi is a native of South America, and not by any means of this country, it becomes a matter of curious speculation to account for a cargo being exported from hence. Supposing the information to be correct, one would almost be inclined to suspect, that the plant may have been an object of cultivation in this country in former times, only that there is not the slightest vestige of any such thing having ever existed; and unless I mistake much, I made inquiries at the time at the Calcutta Custom House, but without eliciting any sort of light on the subject.

Yours, &c.

Botanic Garden, 29th March, 1845.

N. WALLICH.

* This note, as also directions for cultivating the Dividivi, will be found at page 26, of this volume.—*Eds.*

† Dr. Wallich also placed a small supply at the disposal of the Society. The whole of it has been distributed to about forty members, resident in twenty-nine distinct quarters of the Empire.—*Eds.*

Extract of letter from J. TEIL, Esq. to DR. WALLICH, dated Kidderpore, 6th March, 1845.

"I beg to acknowledge the receipt of your note of this day's date regarding the "American Sumach," and to thank you for the communication.

"I shall be most happy to try the effect upon leather, of the *fresh* article you have collected, and to inform you of the result. I have been in the habit of importing the article from America, but whether what I received was too old and dry, or whether it got impoverished on the voyage, I never found it to possess the same astringency and strength as our babool bark for tanning purposes; though, if in these respects, both were exactly alike, still I fear the American Sumach would be found too expensive as a substitute for the country babool bark.

"On account of its want of sufficient astringency and on account of its expensiveness, I have heretofore used the Sumach only in *dress-ing* and *softening* leather; for which purpose it is, in my opinion, superior to every other substance with which I am acquainted. If the article is extensively cultivated in this country, it will, I have not the smallest doubt, be an important auxiliary to the babool bark both in tanning and in dressing leather.

"I shall be most happy to receive a supply of the Sumach seeds, and have the same put down in my garden."

Letter, dated 10th March, 1845.

"I beg to acknowledge, with my best thanks, the receipt of your very kind and obliging communication of last Saturday, the 8th instant, together with a basket of the "Sumach," and a small parcel of seeds.

"I have never seen any Sumach, such as you have been pleased to send me. It is infinitely superior in appearance, cleanliness, beauty, and essential qualities to the American Sumach imported by me. The American Sumach is brought here in a pulverized state, and I beg to send you a small sample of the best I have now in store: but it has not, as you will perceive, the bright, beautiful, greenish yellow color

of your Sumach, and the latter, in my opinion, leaves the other at an immeasurable distance behind, in point of strength or astringency. Upon tasting your Sumach I found it to be fully as astringent as the Aleppo-Galls which I use with babool bark in tanning *fine* skins, and I am inclined to think that your Sumach, if it will not be superior, it will at least be fully equal to the Aleppo-Galls for tanning purposes; while I am certain, from its appearance, that it will impart a brighter color to the leather which may be tanned with it: I shall however put it to the test immediately, and hereafter communicate the result with all my operations for your information.

With regard to the proper time for gathering the pods, it occurs to me that you have pursued the proper course in allowing the pods to ripen perfectly before gathering them: and my ground for entertaining this opinion is, that the babool bark, taken off from a *full grown* tree is found to be more astringent and better adapted for tanning purposes than the bark from a young tree.

Letter dated 27th March, 1845.

I have now much pleasure in forwarding a Goat-skin which has been tanned solely with some of the Sumach grown by you. The time occupied in tanning this skin was altogether about 48 hours, and not more than $1\frac{1}{2}$ pounds of Sumach was used in the process. I find the tanning principle of your Sumach so very powerful, that I am quite satisfied one pound and a half of it will be sufficient to tan a pound of leather of any description. But the actual time in which a skin or hide may be tanned will depend entirely upon the strength of the liquor used for the purpose.

I have done nothing more to the skin which accompanies, after it was tanned, than simply dressing it with a little fish oil.

From the experiment I have made, it is my belief that, for tanning leather of any description, your Sumach will be an excellent substitute for every other substance now used in that branch of manufacture. Indeed I never found either the Aleppo-Galls or even the American Sumach to impart the same degree of softness to leather, as your Sumach has done to the skin I have tanned with it.

I am tanning some more skins with the remainder of your Sumach, in order to ascertain if I shall obtain the same results as in the instance of the skin already tanned and dressed.

Your Sumach will, I think, be found admirably adapted as an astringent mordant for dyeing purposes.

MY DEAR HUME,—I annex copy of another letter from Mr. Teil, who was kind enough to conduct me, yesterday, over his large and important establishment at Kidderpore. I wish I had a cwt. of the Dividivi to send him for trial. What I had I sent him; some portion I likewise forwarded to other destinations. Mr. Teil has promised to favor me with further samples when they are ready.

Yours sincerely,

N. WALLICH.

Botanic Garden, 3rd April, 1845.

DR. N. WALLICH, M. D. &c. &c. &c. *Botanical Garden.*

DEAR SIR,—I regret to find, on reading a second time this morning your very kind letter of the 18th instant, that I have accidentally omitted to reply to it, and I must now throw myself upon your indulgence for the oversight.

It is a source of infinite gratification to me to find, that I have at all been instrumental in developing the properties of the Sumach grown by you, and I can have not the smallest objection to your placing the result of my very humble labors before the Calcutta Agricultural Society. Indeed, as one engaged in a branch of manufacture so peculiarly dependent upon any article which may possess tanning properties, I feel naturally and deeply interested, above perhaps all others, in the successful growth of the American Sumach in this country; for your own labor, combined with the result of the trial made in my Tannery, shews beyond all doubt, that it can be cultivated to very great perfection in this country. It may indeed, considering the useful nature of the article, be worthy the consideration of Government, to hold out some specific encouragement for the growth of the article throughout India. I should have liked very much to have had enough of it to try upon the skins of larger

animals, such as the bullock and buffaloe hides, but from the result obtained in the skins of smaller animals, there cannot be any room to doubt, that it will prove equally efficacious and successful in all others, whether large or small.

The imported Sumach, such as I have received from America, notwithstanding every possible care in the selection, cannot, as I have before explained, be compared to the Sumach grown by you, either for beauty of color, or for strength in tanning properties. It therefore appears to me either that the soil of India is better adapted for its growth than that of America, or that uncommon care was taken in the growth of the Sumach you were pleased to send me.

I remain, &c.

(Signed.) JOHN TEIL.

Kidderpore, 31st March, 1845.

MY DEAR HUME,—Having had some correspondence with the Honorable Mr. Chamier, President of the Agricultural Society at Madras, on the subject of the American Sumach, I am thereby enabled to furnish two very interesting documents, which I enclose, and which I request you will be so good as to submit at the approaching meeting of the Calcutta Society. Namely, extract of a letter from Captain Budd, who has charge of the Establishment at Hoonsoor, dated the 17th ultimo, to Colonel Tulloch, Commissary General at Madras; and copy of a letter to me from Mr. Teil, dated the 10th instant, at Kidderpore.

As the substance of several communications from Mr. Chamier, and of notes to him from Colonel Tulloch, is comprised in the above paper of Captain Budd, I deem it unnecessary to add copies of them. I will only observe, that Mr. Chamier has most kindly and cordially exerted himself in distributing seeds of the tree in question, over the peninsula.

I have the pleasure to enclose also a portion of a small sample of the American Sumach, or Dividivi, imported from England by Mr. Teil, and accompanying his letter to me of the 10th March.

Yours sincerely,

Botanic Garden, 12th May, 1845.

N. WALLICH.

Extract of a letter from Captain BUDD, dated Hoonsoor, 17th April 1845, to Colonel TULLOCH, Commissary General.

I have received one pod, and a packet of seeds of the American Sumach. The seeds I have sown out in different soils and situations ; some in the open air, some in the shade. When the larger packet arrives by banghy, I will distribute it in the way you wish. The pod I shewed to Russell, he had no knowledge of it in that state, except from its smell. I then had it pounded to powder, and he then declared it to be in color, taste and smell, identical with the article in common use in England for the preparation of fine skins. He says that if it could be procured in sufficient quantities, at a sufficiently reasonable rate, it would be of the greatest possible use for the *dressing* of fine skins : and that by its means, the tendency of our leather to become red on exposure to the sun, might be entirely removed, instead of being only partially corrected, as at present. I should be very glad if some few pounds of it could be supplied to me for experiment, either from the Calcutta garden or from what Mr. Teil imports. I think we could equal, if not surpass, the quality of the piece of tanned Goat-skin from his establishment : and which is, I presume, intended to be an imitation of Morocco leather, such as is used in bookbinding. If Mr. Teil finds that the Sumach corrects the objectionable properties of the babool bark, namely, its coloring matter, and its rendering leather tanned by it liable to crack, it must be a most valuable auxiliary to the Indian tanner : for babool bark, deprived of the above objectionable properties, would be a preferable article to the Cassia we now use, because it is by far the more abundant of the two. The bark we now use is that of the Cassia auriculata of Linnæus. You will find it described at page 190 of Dr. Wight's *Prodromus Floræ Peninsulæ Indiæ Orientalis*, vol. 1. It is called in Tamil *Avārum chādy*, and in Canarese *Thungādee Giddah*. I send herewith a few of the pods from a self-sown shrub in our tannery compound. We can easily tan with it light skins, such as sheep and goat-skins, in from 48 to 60 hours. I will send you in a few days a specimen of goat-skin, tanned, dressed with oil, grained up, and polished, to compare with Mr. Teil's specimen : the peculiar color given by the Sumach is the only particular in which I despair of equalling it. Russell thinks that Sumach used by *itself*,

as a *tanning* substance, would not answer for other than *light* skins : and that for bullock or buffalo hides, it would be less efficient than our bark, because it would not make them swell in the pits. I cannot find here any one acquainted with the tree called *Pee Vally* ; so if you will kindly send me up some of the pods from Madras, I can ascertain what, if any, quantity of tanning they yield, and shall perhaps recognise the tree in these jungles, by means of the pods.

No. 273.

DR. N. WALLICH, M. D. *Botanical Garden, &c. &c. &c.*

DEAR SIR.—I feel exceedingly obliged by the very interesting papers from Madras, you have been good enough to forward for my perusal, with a parcel of the *Cassia* pods.

I was aware of the *Cassia auriculata* being used by the natives of this country for tanning leather, but I have never made use of it myself for that purpose, on account of a deep coloring matter it possesses, and on this account, it will not, I think, be found to surpass the *Dividivi*, should the latter once obtain as fair a trial as the other has received.

The *Cutt*, or *Terra japonica*, is doubtless a stronger tannin than the *Cassia*, or than even the *Sumach*, but it will never, I think, of itself, or without some auxiliary or adjunct, give the same pliancy or elasticity to leather which the *Sumach* does, or as your *Dividivi* will certainly do ; while, from its very heating nature, it does not preserve leather so well as I have found the *Sumach* to do. It has besides the effect of shortening the fibres of the leather, which in itself constitutes, perhaps, the strongest objection to the use of it as a tannin, when other and safer substances can be found to answer the purpose much better, and at, probably, even less cost and trouble.

I have, in my time, when wanting the experience I now possess, made use of the *cutt* as a tannin, but I was obliged, from losses, and other causes, to abandon it, and to resort to the babool bark, the Aleppo-Galls, and the American *Sumach*, in its stead ; each of which I found to be every way preferable to the other.

Of all the substances *hitherto* used by me for tanning leather, the babool bark I have found to have the least coloring matter in it ; and I have never found that it had a tendency to cause the leather tanned with it, either to become red on exposure to the sun, or to

crack after a short time. These effects, I am led to think, are owing more to the way in which the leather in its raw state is managed, than to the substance used to tan it with, for the foundation of successful and perfect tanning rests entirely on the way in which the hide in the first instance is cleansed and limed, before it is removed to the tan vats; and if this point be ever neglected or mismanaged, it cannot, afterwards, be remedied by the substance which may be made use of for tanning. Our Indian sun is, however, enough to scorch, harden, discolor and crack almost any substance exposed to its effects for any time, and until its rays are mitigated, we can, I fear, never hope to produce tanned leather to wear and retain its color so well in this country as that tanned and used in more temperate climates.

I have in my former communications mentioned that I had not enough of your Dividivi to try upon large hides, though, as it answered so well upon the small skins, there cannot, I think, be any doubt that it will answer equally well upon the large hides. The babool bark, however, has been well tried, and it has been found to succeed admirably well, at least in this place, so much so indeed, that I may mention only one fact, in proof of it. Some years back, for instance, by way of experiment, I tanned some leather with it, and shipped it to London for sale, where, to my surprise, it fetched a penny, and a penny and a half the pound, more than the leather tanned in England with the oak bark !!

I am getting some small skins ready for you, tanned with the babool bark, and also with the American Sumach, which I hope will be found even superior to the skin I before forwarded to you.

I have a small quantity of American Sumach on hand, but it has unfortunately imbibed so much damp, that it is not fit for use, or I would have been most happy to have supplied you with a few pounds for transmission to Madras.

I have the pleasure, with my best thanks, to return the several very interesting papers received for perusal from you, together with the parcel of Cassia pods which accompanied them.

I remain, &c.

(Signed.) JOHN TEIL.

Kidderpore, 10th May 1845.

MY DEAR HUMB,—I have the pleasure to enclose copy of a letter I received yesterday from Mr. Teil, with a portion of each of the three skins that accompanied it; all extremely interesting and satisfactory. I never met with any thing of the sort more velvety soft than the two kid skins not tanned with the American Sumach; and the calf skin, which has been tanned with the drug, but not worked or dressed subsequently like the others, affords decisive proof of the superiority of the drug above the Baubul, and Cassia auriculata bark.

Yours sincerely,

N. WALLICH.

Botanic Garden, 31st May, 1845.

I have sent Mr. Teil a small remnant of Dividivi, suggesting a trial with it for preparing a kid skin, Morocco fashion—or for using it in any other way he might prefer.

N. W.

To DR. N. WALLICH, M. D., Botanic Garden, &c. &c. &c.

DEAR SIR,—I was duly favored with your letter, dated the 21st instant, annexing copies of a letter dated the 17th idem, from the Secretary to the Agricultural Society, and of the Resolution referred to in it; and I now beg you will do me the favor to tender to the Society my grateful acknowledgments for the very flattering manner in which, through your kindness, my humble labors in developing the tanning properties of your Sumach, have been noticed by them.

As promised in my letter of the 10th instant, I have now much pleasure in forwarding to you three skins, which I have tanned separately with your Sumach, and with the Babool bark, marked A. B. and C.

The skin marked A. is a piece of calf skin, tanned exclusively with Sumach, with the grain in its natural state, (or without being dressed) in imitation of Morocco leather. The tanning was completed, altogether from the commencement, in 41 hours. It is evident, from the appearance of this skin, that your Sumach, as a tannin, has very little coloring matter in it, and that consequently skins tanned with it, will admit of being afterwards dressed into any color

excepting drab and light yellow, for which the original color produced by the Sumach, is a little too deep. This skin has been tanned for the last four days, and I have purposely detained it, until now, to see if exposure to the air has a tendency to make it become red, or to cause it to harden and crack : but I have much pleasure in adding, that no change whatever has taken place, either in the color or flexibility of the skin, since the day it was tanned ; so that this experiment, in my opinion, fully establishes the superiority of your Sumach, as a tannin, over the Cassia auriculata used at Madras.

B. and C. are two kid skins, which have been tanned with the Babool bark. They were 48 hours in tanning. B. has the grain in its natural state, or simply raised so as to be adapted for shoe leather. C. has the grain worked in imitation of Morocco leather. These two skins have been tanned for nearly a month, but no visible change has taken place either in their color or softness, since the day they were tanned.

From the experiments now brought to notice, you will perceive that the calf skin was tanned with your Sumach in a shorter space of time than the kid skins were with the Babool bark, from which it may I think be fairly assumed, that the fresh Dividivi, or the Sumach you sent me, is more powerful, as a tannin, than the Babool bark.

The reason why I send you only a *piece* of calf skin, is because, unfortunately, I had not enough of your Sumach to use upon a whole skin.

If either yourself or the Agricultural Society, or the authorities at Madras, should wish me to make any further experiments with your Sumach upon leather, I shall be most happy to the utmost of my ability to undertake them, provided I am supplied with a further quantity of your Sumach—of which, at present, I have none left.

I remain, &c.

(Signed,) JOHN TEIL.

Kidderpore, 30th May, 1845.

CORRESPONDENCE CONNECTED WITH THE FORMATION OF A GOVERNMENT EXPERIMENTAL GARDEN AT KISHENPORE, IN CHOTA NAGPORE, FOR THE CULTIVATION OF COFFEE.

Extract of a letter from Lieutenant-Colonel J. R. OUSELEY, A. G. G., S. W. Frontier, dated Chota Nagpore, 29th April, 1845.

"I do not know whether you are aware, that the *finest* coffee produced in India, is grown in my own experimental garden. I send you the report on which the Government sanctioned the garden they keep up here : and am anxious that people should know, that the climate and soil agree so well with the culture of coffee."

To the Agent to the Governor General, South West Frontier.

SIR,—With reference to your letter, No. 20, of the 17th May last, and to the accompanying copy of a letter and enclosures from the Officiating Superintendent of the Honorable Company's Botanic Garden, relative to the proposed culture of the coffee plant at Kishenpore, I am directed to inform you that, under the circumstances now reported, the Honorable the Deputy Governor of Bengal is pleased to sanction the experiment on a small scale.

2nd. You are accordingly requested to communicate as before with Dr. Griffith, on all questions connected with the subject, and to submit an estimate of the expense to be incurred for the Experimental Garden.

I have, &c.

(Signed,) A. TURNBULL,

Under Secretary to the Government of Bengal.

Fort William, 10th July, 1843.

To T. R. DAVIDSON, Esq., Secretary to the Government of Bengal, in the General Department.

SIR,—I have the honor of forwarding a copy of a letter from the Agent to the Governor General, South West Frontier, in answer to my communication to your department, No. 32, of the 4th April last, together with a highly favorable certificate procured through Mr.

C. K. Robison, and the characters and analysis of the soil, supplied by the Honorable Company's Deputy Apothecary.

2nd. As the coffee really appears to be of excellent quality, and as the circumstances connected with the soil, climate, and mode of culture appear so promising as to warrant the expectation of success,—I beg to report in favor of the experimental garden in the manner and on the scale proposed by Colonel Ouseley, which will, judging from Colonel Ouseley's communication, be limited almost to a trifling ground rent.

3rd. It seems to me that the same locality, which promises so well in coffee cultivation, presents many recommendations for selection as a site for a Cotton experiment, in which case it might be deemed advisable to have qualified European superintendence; I cannot however hope for any advantage from detaching a Malicee from this establishment, which does not possess one of the requisite intelligence, activity, and steadiness.

I have, &c. &c.

(Signed.) Wm. GRIFFITH,
Officiating Superintendent.

*Hon'ble Company's Botanic
Garden, 20th June, 1843.*

To C. K. ROBISON, Esq. Calcutta.

DEAR SIR,—This morning your sample of coffee came to hand, and we consider it as good as any of the plantation coffee shipping from this; the value in London market by last advices being from 85 to 90 shillings per cwt. had the parchment been cleaned properly off the berry; we must look for much lower prices when all the plantations now under cultivation here come into bearing. The yield of good plantations here may be reckoned at from 12 to 17 cwt. per acre, some patches have given 18 cwt. of such coffee as your sample.

We remain, &c.

(Signed) WILSON, RETCHIE AND Co.

Colombo, 28th April, 1843.

A few particulars regarding some of the Esculent Roots and Fruits of Central Africa. Communicated by the Rev. DAVID LIVINGSTONE.

To J. HUME, Esq., Secretary, Agricultural Society.

MY DEAR HUME,—About a month before I left the Cape of Good Hope, I had the pleasure to write to you, reporting the manner in which I had tried to execute the Agricultural Society's commission*. The copy of my letter on the occasion to Mr. Livingstone, was sent to you at the time; and I have now the satisfaction to enclose his reply, dated Mabotsa, 18th August last year. It arrived yesterday afternoon per *Phanis*, (as appears on the outside) having been received in Cape Town on the 11th December. The letter is very interesting, and I have no doubt it will be properly noticed by the Society. I shall only add, that I will send Mr. Livingstone such things from hence as, I may hope, will prove acceptable to him.

Believe me, &c.

N. WALLICH.

Botanic Garden, 10th April, 1845.

To DR. N. WALLICH, Superintendent H. C. Botanic Garden, Calcutta.

MY DEAR SIR,—Having found your most welcome communication of 22nd March, during a recent visit to Lattakoo, I immediately on returning to my own station, commenced operations in order to a full and hearty compliance with your request on behalf of the Agricultural and Horticultural Society of India. I have employed natives of different tribes situated near the Desert; and hope, by their assistance, soon to obtain most of the esculents, which at this season are in a state fit for transmission. And as I know the Rev. R. Moffat will aid me as much as he can, in conveying them to the colony, it is probable not very many months will elapse before I shall be able to announce my first assortment as thus far on its way to its final destination. Several however of the roots and fruits

* The details of this commission will be found in the Proceedings of the Society for November 1843, published in Vol. 11, page 481; and Dr. Wallich's reply, in the Proceedings for June 1844, Vol. 11½, page 75.—*Eds.*

which, by way of sample, I should have preferred sending first, must necessarily be reserved for a future opportunity. One in particular I regret I cannot send, because I think it would act as a stimulus to induce you patiently to try the effect of cultivation on the whole. It is a tree, and though growing frequently in the most dry and sterile situations, is found of different sizes, from a low bush to a tree thirty feet in height and one and a half in diameter. It yields a small fruit which the natives describe as very agreeable. But the root is the most interesting portion, for when pounded in a mortar, in order to separate the woody fibre from a farina which it contains, an apparently very nutritious article of diet is obtained. This farina is sweet, but has a slight degree of bitterness combined, the latter however is not discernible when (as the Bechuanas use it) it is mixed with fresh milk. The saccharine prevails over the bitter now, and probably by cultivation in India the latter would entirely vanish. But should both be increased in intensity, to individuals requiring a nutritious tonic it might prove a valuable substitute for Tapioca. To such I have prescribed it, but I have not sufficient experience of it to justify any conclusion. The native name is *Omotlope*. I have seen neither flower nor fruit.

Another root, but much less in size than the above, and by no means so agreeable, is relished very highly by a tribe called the Bakwain, whose country is situated on the Tropic; the greediness with which they dug and devoured it at a time when we had an abundant supply of animal food, which to Bechuanas is superior to every thing, induced me to enquire the reason of their preference, and I found that several years ago, when their tribe was attacked and driven into the Desert by another, this root was their chief means of subsistence for many months, and "since that time," said they, "we have always relished the '*Tihopo*'." The "*Makuele*" too, a tuber from which the natives take a name for our potato, could, I hope, also be improved by cultivation. And if we can only get three or four capable of being as much improved by cultivation as the potato, our labour will not be in vain.

It may be proper to mention, that having observed many of the esculents used by the Bushmen and Bakalihari of the desert, in parts which have never been reached by Europeans, who adopt the usual

modes of locomotion the country affords, I have found it necessary to send natives to these localities. But though the distances are considerable, I hope by drawing as much as possible on the friendship of the different chiefs whom I know, the expenses will not be very great. Perhaps the largest item in connection with collecting will be that for the fruit and seed of a tree which grows in Lat. 21° S. Long. 28° E.; the fruit is as large as an ostrich egg, and said to be very good, (I cannot speak positively about it, as I only saw the shells of it lying about); the fruit of another tree of truly enormous growth is also said to be very good. For these I have offered presents of the value of three pounds. But I shall be most careful not to abuse the confidence the Society honours me with.

In conclusion, allow me to assure you, that if I can in any other way be of service to you, I shall expect you to tell me how, without either introduction, preface, or apology. For I am always delighted with being employed in that which tends to benefit mankind, and will readily do any thing not inconsistent with the object for which I came to this country.

Believe me, &c.

DAVID LIVINGSTONE.

P.S. I beg leave, in reference to the Indian plants and seeds, to return my warmest thanks for your kind proposition, and as you will be better able to judge what ought to be tried, I shall take an early opportunity to give you some idea of the physical characteristics of the country around my new station Mabotsa, which is situated about 30 miles North West of what are called the Kurrechane Hills.

A List of the Timber trees of the Province of Malacca. By J. W. WESTERHOUT, Esq., Assistant Resident. Communicated by C. K. ROBISON, Esq.

To J. HUME, Esq., Secretary to the Agricultural and Horticultural Society.

SIR,—I beg to send you a “list of the timber trees of the province of Malacca,” prepared by Mr. Westerhout, Assistant Resident there, which I have been requested to present to the Society.

The list was prepared by Mr. Westerhout, at the suggestion of the late lamented Mr. Griffith, and I am authorized to state, that it will shortly be followed by specimens of all these timbers, fit for experiment, and a descriptive catalogue, containing their qualities and uses, some of which Mr. Westerhout considers very valuable.

Mr. Westerhout states, that the forests are of easy access, but that there is a great want of hands to bring the timber to the wharf, as the Malays refuse every thing like steady work.

The "Marbouw" is represented as resisting the attacks of white ants for one hundred years and upwards, and as it is very well calculated for beams and all housework, I would hold it to be a good speculation to send down a small gang of Hill coolies (who are skilled in felling trees) for this purpose; but when the specimens arrive, a Committee can be appointed to examine them, and report to the Society.

I am, &c.

C. K. ROBINSON.

Calcutta, 24th April, 1845.

List of the Timber trees of the Province of Malacca, by J. W.

WESTERHOUT, ESQ., *Assistant Resident, Malacca.*

Tampinees,	Lanioosoo,
Blean,	Rangas,
Marbouw,—very strong & hard,	Rassaak,
Tambosoo,	Natoo,
Tampang,	Saraya,
Madang Katanahan,	Marantee,
Kalat Meerah,	Lida Karabouw,
Galam Tekoos.	Pisang Pisang,
Madang Boagah,	Mangaranan,
Madang Konjeet,	Pataleng,
Madang Lawang,	Salomar,
Madang Paranas,	Dalle Dalle,
Madang Langodee,	Baloon Ejook,
Madang Samenjaak,	Madang Taloor,
Madang Kawan,	Bintangoor,

Bonoot,
 Kampaas,
 Jalotoong,
 Giham,
 Paning Paning,
 Pannah,
 Kalat Potee,
 Kalat Lapies,
 Chengal,
 Pinang bahie,
 Tolang Daheeng,
 Chechaar,
 Gombang,

Madang Kaladee,
 Madang Tandook,
 Sagah,
 Panagah,
 Kledang,
 Marsanah,
 Tarantang,
 Brombong,
 Mankadoo Otan,
 Golam Zekoos,
 Kalaat Menah,
 Maraboun Lahoot.

Notice of Horticultural operations in the Garden of the Branch Agri-Horticultural Society at Lucknow. Communicated by CAPTAIN G. E. HOLLINGS, Secretary of the Society.

To J. HUME, Esq., Secretary, Agri-Horticultural Society of India.

MY DEAR SIR,—I have to thank you for your favor of the 29th ultimo, and the Dahlia seeds which you so kindly sent. As many of the seeds that I got from England, and bulbs which were given to me by different friends who had received them from the hills, or obliged me with some roots of their own growing, are thriving in perfection, and in addition to the seed forwarded by you, I have great reason to expect a good supply of bulbs from Mussoorie; I anticipate having a grand show next season.

I really have not time to give you an account of our proceedings since I last wrote. I have succeeded in raising cucumbers from English seed by forcing the seeds in a hot bed, and afterwards planting them out. I have received the two cucumbers first produced from seed; they are finer than any I have seen in India. I will send some of the seed when dry to Major Napleton and the Society. I purpose sending in a few days, in a large box, to be forwarded by steamer from Allahabad, specimens of all the different products of the garden that will bear being transported, and seeds of all kinds of flowers, and shall feel obliged by your undertaking the office of dis-

tributor to those persons, members of the Society, who are desirous of getting seeds from Lucknow. I always do all I can to meet the requisitions of applicants; but the fact is, we have not a sufficient establishment to enable us to work out a system to ensure regularity and certainty, and therefore I think it best to send all that we can spare, or nearly so, to you and Major Napleton, and to indent on your kindness to distribute them.

I think I mentioned in a private letter to you, that I had raised a very peculiar melon, answering to the description of the Queen Anne's melon, of which you formerly sent one seed to me; the scent and flavour of the fruit was delicious; the size that of a large orange of the kind called by the natives "Rungturah." I have preserved a few seeds, and will share all those that appear good with you and Major Napleton.

One of the plants from English strawberry seed bore fruit this year; the flavour was excellent, and I hope to be able to preserve the variety. We have had two splendid crops of strawberries this year; the first during the period of Prince Waldemar's visit, from the 20th to the end of March; and the second has lasted for more than a fortnight, and we are getting between three and four seers daily: the fruit is large in size, and has a very good flavour. I am rather conceited about the strawberries, because when I first took charge of the garden, the mallees said it was of no use trying to cultivate them, the soil would not admit of it: as it may be useful to others, I will tell you what was done.

After the *Rubbee* crops were gathered, the ground allotted to the cultivation of strawberries was allowed to remain fallow; at the commencement of the rains a large quantity of old "*guleez*," street scrapings, that had been kept for more than a year, was strewed over it, and, after a shower or two of rain, worked into the soil which was ploughed and turned with "*fouras*," spades: all the rain water that fell was kept in the field by banking up the sides; after the rains had subsided the soil was turned once more, and the young suckers from the last year's roots planted at a distance of a foot or eighteen inches from each other. As an experiment, previous to planting out, circular holes, about six inches in diameter and from ten inches to a foot deep were dug, about four inches were filled up with manure, and

the remainder with a rich compost, and the plants were set in the middle: (I got this hint from Colonel Wilcox,) before planting, a sprinkling of manure from the sheep-fold was spread over the field, and a reservoir was formed, in which the same rich manure was deposited, and all the water that irrigated the field passed through the reservoir; as soon as the plants began to blossom, they were watered with pure water every third or fourth day; the plants which were put into the circular holes have given the best fruit. I forgot to mention, that in the compost used there was a proportion of about one-fourth of river sand.

Having mentioned how the strawberries were cultivated, I will add our receipt for growing celery.

At the commencement of the rains, trenches three feet deep were dug, and filled with olds weepings from the cattle sheds, i. e. the manure called "*goba*," which is not cow-dung, such as is used for fuel, but a compound of refuse straw saturated with dung and urine, left in the open air, and occasionally turned for at least one year, which was allowed to remain until, from heat and rain, it was completely decayed, which absorbed two-thirds of its bulk. The plants that were so much admired at the exhibition in December were obtained from the Lucknow Cantonments and grown from *slips*, not seed, which were taken from the original plants just before the blossom appeared, and placed in small nurseries under the shade of thick leafy trees, such as the Loquat. In making the celery beds one-half of old manure obtained from scraping the streets and other deposits, called by the natives "*guleez*," was added to an equal quantity of ordinary garden soil, and well mixed with it; this compost was put over the decayed manure above alluded to, the plants were transplanted from the nurseries towards the end of October, and placed at a distance of two feet between each—the soil which had originally been excavated forming a protecting bank; as the plants increased in size, they were regularly earthed up in the same way as cauliflowers are, and were ready for use in two months.

It is necessary to be careful about the quantity of water in the absence of rain, and when the weather is dry it is advisable to water the plants every three or four days, but not to such an extent ~~as to~~ let the moisture get under the roots.

It is probable, that in Bengal there is more chance of too much than too little moisture, and I would in that case recommend a mixture of sand with the compost, and also the adoption of some arrangement for drainage, as too much moisture at the roots would make the plants weedy and tasteless, even if there was not quite sufficient to rot them.

I am indebted for these two receipts to Nund Lall Misr, an inhabitant of Mynpoorie, who is the darogah of our garden, and to whom is to be attributed all the success that has attended the experiments that have been made under my auspices ; and if they are considered of any value, it would be gratifying to me to be the medium of communicating to him the expression of the sentiments of the Agri-Horticultural Society regarding them ; and although I have done all in my power, by an increase of salary, to show the opinion I entertain of his skill, industry and honesty, I am fully convinced that nothing could tend more to gratify his honorable pride, or stimulate him to future exertions in the good cause of Agri-Horticulture, than the knowledge that his exertions were appreciated by the Parent Society.

Believe me, &c.

Lucknow, 6th May, 1845.

G. E. HOLLINGS.

P.S. I had almost forgotten to mention the full success that attended the Darogah's experiment of slipping potatoes ; it was tried on a comparatively small scale, but the fruit was very nearly as fine as any grown in the garden. The Darogah obtained his information from Major Sturt, who commanded the 2nd Regt. O. L. Infantry at Seetapore, who saw an account of the method in a newspaper and tried it : the Darogah was then the Bazar Chowdry of the Regiment, and having the opportunity, repeated the experiment in the Char Bagh, which is the designation of our garden, and, as I have said, succeeded. There is one great advantage in the arrangement, which is, that you got fresh potatoes about a month or six weeks later than from the ordinary methods of growing them. Some care is required in the preparation of the soil, and in protecting the slips when first planted.

I have just received a handsome supply of bulbs of the *Orchis mascula* from my friend Lt. Brooke of the 63rd : it seems to me that they are not so clear and transparent as those I got from the Oude Terrace, but they are infinitely superior in size and appearance.

Although the mangoes have failed throughout the Upper Provinces,—there were eleven thousand blown off the few trees that bore fruit this year in the garden, and three hundred from the graft trees,—those that are left promise to be very fine, and we have a very handsome display of grapes and peaches. I have determined, not without a pardonable reluctance, to send two plants each to the Society and Major Napleton of the Vines grown from seeds brought up by Sir W. Nott from Cabool, in the boat that I am to despatch from Lucknow.

G. E. H.

REMARKS ON THE APPLICABILITY OF THE NERIUM (WRIGHTEA)
TINCTORIUM FOR THE MANUFACTURE OF INDIGO.

(Extract of a letter from C. B. TAYLOR, Esq., of Rajharra Factory, Palamow, dated 21st November, 1844.)

In lately reading over a volume of the “Library of Entertaining Knowledge,” treating of vegetable substances, I found an account of a tree discovered by Dr. Roxburgh, and called by him ‘*Nerium tinctorium*,’ which produced a very superior quality of indigo, and as I do not believe that the existence of such a tree is generally known, I take this opportunity of bringing the subject to your notice. It is possible that some of your Members may know of the existence of the tree; but as many may be as ignorant of it as I was, until I saw the account alluded to, I shall transcribe all that relates to the subject from the volume in question, for general information.

It appears most remarkable, that a tree producing such a valuable substance as indigo, and that of a superior quality, and ‘attended with much less labour and cost’ than the indigo produced from the common ‘*Indigofera tinctoria*’ of the country, should be totally unknown; this appears to me to throw some slight suspicion upon the correctness of the statement which I have transcribed, but I should strongly recommend your writing to one of the Civil Officers stationed at Chicacole, or to some other station in the Northern Circars, for information respecting the tree, also for a supply of seed when it ripens in January; and if it be really a true account, and the indigo

can be made from the tree 'with much less labour and cost' than indigo from the well known plant, I suspect it will not long be said, 'but it has not yet taken its place among the imported Eastern productions'.*

Extract.

"In the year 1792, Dr. Roxburgh transmitted home a sample of indigo prepared from the leaves of a species of rose bay, which he distinguishes by the name of *Nerium tinctorium*. From the excellent quality of this indigo, and other advantages attending its cultivation and preparation, it might have been supposed that the *Nerium* indigo would quickly have become an article of commerce, and have been in much request among our dye houses; but it has not yet taken its place among the imported eastern productions, though it should seem that the extensive cultivation of this tree would be attended with much less labour and cost, and offer a greater certainty of profit than the common indigo plant.

"The *Nerium* grows plentifully throughout the Carnatic, and in every part of the Circars where there are hills and mountains, being an extent of about a thousand miles in length; near inhabited places it is so often cut down for fire-wood, that in such situations it is always found in the state of a very small tree or a large bush; but when suffered to reach its full growth, it attains to the height of from eleven to fifteen feet up to the branches. Its trunk, which is of an irregular shape, is about a foot and a half, to two feet in diameter. Its bark when old is scabrous; but when young, smooth and ash-coloured. The

* With the view of carrying out this suggestion of Mr. Taylor, the Secretary addressed Dr. Wight at Coimbatore, in a letter under date the 18th of December, of which the following is an extract:—

"I have the pleasure, on behalf of the Agri-Horticultural Society, to enclose extract of a letter from a member on the subject of the *Nerium tinctorium*, and to solicit the favor of any additional information you may be able to afford respecting the useful properties of this tree. If it is much used by the natives on your side of India for the dye it affords, if that dye is equal in color to that given by the *Indigofera tinctoria*, &c. &c. Dr. Wallich, in reply to a note I addressed him on the subject, observes, 'I suspect there must be some weighty ground, for neither the *Marsdenia* or *Nerium* (*Wrightea*) being extensively cultivated for their produce; nevertheless they appear to me quite worthy of further enquiry.' Dr. Wallich adds, that he has neither seeds nor plants of the *Nerium* to give from the Botanic Garden, but hopes to multiply from the only tree he has left. Could you favor us in the meanwhile, with a small packet of seeds?"

A reply to the above communication has not yet been received, but Dr. Wight has kindly forwarded a supply of seed, which is available to any members, Indigo planters and others, desirous of introducing this tree into their respective districts.

wood of this tree is remarkably white and close grained, in appearance resembling ivory. The leaves are oval, pointed, tolerably smooth, and of a pale green colour; they are very numerous, and when full grown, from six to ten inches long, and from three to four inches broad. To cause a greater production of leaves, it should be cut low as the mulberry trees are for feeding silk-worms, and like them the oftener it is cut down the greater is its disposition to increase. Many shoots issue from the old stumps, and in the space of one year these shoots grow to various heights—from one to ten feet, according to the nature of the soil and season. The leaves fall at the commencement, or during the colder part of the year. In March, or the beginning of April, the young leaves together with the flowers first make their appearance towards the end of April; those which were earliest in unfolding attain to their full size. This period was found by Dr. Roxburgh to be the most favourable for gathering the leaves; about this time also it ceases flowering, and many of the seed-vessels become perfectly formed, though the seeds do not ripen until January or February. The leaves remain in a fit state for gathering until about the end of August, when they begin to acquire a yellow rusty tinge, and are gradually cast. The colouring matter resides in the leaves alone; all trials to extract any from the twigs proved unsuccessful. Indigo is prepared from these leaves, in the same manner as from the indigo plant by the scalding process. The leaves of the *Nerium*, unlike those of the common *Indigofera*, will not yield their colour to cold water, but by hot water it is readily extracted. Hard spring water is found preferable in increasing the quantity, and improving the quality, of the indigo. After being exposed to the action of the fire for about three hours, the leaves begin to assume a yellow hue, then the scalding has been sufficiently pursued; and as the agitation and precipitation do not consume a longer time, the whole process is very speedily completed. From two to three hundred pounds of green leaves, yield one pound of indigo."

Since writing the above, I have referred to the article Indigo, in the American Encyclopædia and in Ure's Dictionary, the former merely mentions the *Nerium* as a known species of Indigo; but the latter, in enumerating the various species, says 'The *Nerium tinctorium* affords some indigo.' The same expression 'some indigo,' does not go far to corroborate the very favourable account of the tree, which I have extracted from the Library of Entertaining Knowledge.

An account of the successful propagation by seed of a superior variety of Mangoe. Communicated by P. HOMFRAY, Esq.

To JAMES HUME, Esq., Honorary Secretary to the Agri-Horticultural Society.

DEAR SIR,—As it is probably not generally known, that the stone of the mango fruit produces a tree which, without being grafted, will bear fruit precisely alike in appearance, flavor and quality, to that produced from the parent tree, I beg to state, in proof of my assertion, the following facts, which have come under my notice, that you may, if you think proper, recommend at this the proper season, an extensive propagation of good mangoes by planting the stones of choice fruit. The late Mr. Overbeck, formerly Governor of Chinsurah, had in his garden a mango tree imported from Java; he sent a basket of the fruit of it to the late Mr. Hampton of Howrah, who planted some of the fruit stones in his garden, and a tree from one of them having been found to bear fruit exactly alike in every respect to the fruit from the parent tree, Mr. Hampton was induced to plant some of the stones of the fruit from off his own tree. The trees raised from them, (viz. three or four in his garden, one in mine, and two in Mr. J. Homfray's garden) have all, without exception, borne precisely the same kind of fruit in appearance, flavor and quality, as the fruit which came about fifteen years ago from Mr. Overbeck's tree, and which I tasted. Mr. J. Homfray has likewise in his garden a grafted tree, received from the Botanic Garden, of the Mazagon mango, stones from the fruit of which he planted, and one or two of the trees raised therefrom have commenced bearing, and produce fruit exactly alike, and fully equal in every respect to the fruit of the parent tree. These nine or ten instances, without a single exception, convince me that, in planting mango fruit stones, perfect reliance may be placed on their producing trees which, without being grafted, will bear fruit precisely alike in appearance, flavor and quality, to the fruit from the stones of which the trees were raised. What facility have we not then to stock our gardens, and the country with mango trees, of every choice kind, by importing mango stones from Bombay and other places, and planting them, in addition to the good sorts we have at hand. The trees commence bearing at six or seven years old, and

grow kinder than grafted trees usually do. I send per bearer for your own tasting a few (there are not many on the tree, which is young,) of the mangoes from off the tree in my garden which, as I have stated, was raised from a fruit stone from off a tree of the late Mr. Hampton's, which was again raised from fruit off the late Mr. Overbeck's tree imported from Java.

Yours faithfully,

Howrah, 21st May, 1845.

P. HOMFRAY.

A MODE OF CONVEYING CUTTINGS OF PLANTS FROM ONE PART OF THE
COUNTRY TO ANOTHER.

*(Extract of a letter from Lieutenant-Colonel L. R. STACY, C. B.
Futteeghur, dated 29th March, 1845.)*

"In 1823, I sent to a friend in Calcutta some cuttings of a very fine Bokhara plum, from which to take buds. The plan succeeded so well, that I make it known to you, that in case it should not have been noticed, it may be adopted."

"I cut off the branches into slips of from 8 to 10 inches, and introduced them carefully into a circular box made of the body of the plantain tree, taking out as many layers of the heart as allowed the plum branches to lie comfortably inside. The ends I left untouched. I sent them dāk, wrapped of course in a cover of wax cloth, from Dinapore. I have no doubt but that they might be sent any distance by this arrangement."

"Will you suggest to any amateur gardeners some experiment with *Neem* tree leaves as a manure, and a decoction of them as a specific for driving away insects?"

AN ACCOUNT OF THE FIRST, THIRD, AND FOURTH EXHIBITIONS OF VEGETABLES, FRUITS, &c. HELD DURING THE SEASON 1844-1845, BY THE BRANCH AGRI-HORTI. AND FLORICULTURAL SOCIETY OF BHAUGLEPORE.

J. HUME, Esq., *Honorary Secretary of the Agri-Horticultural Society of India.*

MY DEAR SIR,—In forwarding the accompanying account of our Horticultural exhibition, which took place on the 19th instant, I have the

honor, by request of our Branch Society, to solicit the favour of your submitting them to the Parent Society at the next Meeting. There is not at present a yard of ground in the Public Garden (which is now 15 beeghas) uncultivated. The fruit and other trees are in a most healthy condition, and rapid progress is making in the Floricultural Department, and my letter of yesterday's date to your address will have shown you, that our experiments in Agriculture, although limited (for want of a larger field to work in,) are likely to turn out well. We have a Nursery of very promising coffee plants, and also of Bombay Mango Seedlings, Orange, Loquat, Leechee, Sitsal, Toon, &c. &c.

I remain, &c.

T. E. A. NAPLETON,

*Cleveland House, Bhaugulpore,
November 24th, 1844.*

*Secretary, Bhaugulpore Branch
Agri-Horti-and Flor. Society.*

FIRST SHOW OF 1844-1845.*

An exhibition of flowers, vegetables, and fruits took place in the public garden on Tuesday afternoon, the 19th November 1844, at 3 o'clock. The attendance of resident Members of the Society, both European and Native, was unusually great. It was very gratifying also to observe, that several subscribers to the institution belonging to other districts, together with many ladies, honored the show with their presence, and expressed themselves highly pleased with the various specimens brought forward to compete for prizes. Very little rain having fallen in this quarter since the 1st September last, constant irrigation has of course been resorted to, and owing to such an unusual drought, caterpillars and insects (as might have been expected) committed great ravages on the early sowings. The Society's garden produce consisted of new potatoes, cauliflower, asparagus, turnips, carrots, beet root, salad, cucumbers, arrow-root from imported West India roots, Cabul capsicums, and various other vegetables. Amongst the beauties of flora, were a remarkably fine display of dahlias, mignonette, passion flowers, pereskia bleo, plumbago, geraniums, roses, euphorbias, wall-flower, zinnias, dwarf balsams from English seed, together with many other rare flowers were exhibited, amongst which heliotrope in the greatest profusion describable may be justly included.

Umpires having been elected; every sort of vegetable specimens were brought before them for inspection in separate *dallees*, by which

* By an unfortunate oversight, this account was omitted to be inserted in the third volume of the Journal. An account of the second show will be found at page 38, of this volume.—*Eds.*

arrangement they were at once enabled to decide on the respective merits of each kind, and their opinion was as follows :

1st. That the public garden produce, although not allowed to compete for prizes, was most excellent and satisfactory.

2nd. From Dr. Stuart's garden—peas, cauliflower, asparagus, lettuce, beet root, turnips, scarlet radish, Jerusalem artichokes, love apples and plantains carried off prizes ; and amongst the dallee from private gardens, brought forward for competition, his were on the whole pronounced to be the best.

Prizes were also awarded to the mallees of the following gentlemen on account of various fine specimens :—

To Mr. J. Pontet's garden, prizes were awarded on account of peas, beet root, carrots, turnips, leeks, herbs, chillies, arrow-root, and country beans.

To Mr. G. F. Brown's, for onions, ginger, country beans, and cucumbers.

To Mr. J. Glass' for onions, lettuces, and yams.

To Mr. J. Piron's for carrots, turnips, and radishes.

To Mr. Quadros's for turmeric.

To Baboo Goeroochurn Mitter, for leeks, indigenous vegetables, and tobacco.

To Serjeant Dowling, for Cabul capsicums.

To Mahomed Rafiq, Sudder Alla of Patna, Muddun Tackoor, and Muhasha Omanath Ghose, large Zumeendars in this district, for indigenous and other vegetables.

To Cleveland House, for early potatoes, French beans, asparagus, cauliflower, and endive.

The Floricultural specimens from private gardens justly called forth much admiration, and prizes were given as follows :

To Captain Don's mallee for roses, honeysuckle, geraniums, russelias, and euphorbias, pinks, exotics, zinnias, and heliotrope.

To Mr. G. F. Brown's for roses, mignonette, zinnias, and heliotrope.

To Cleveland House for roses, honeysuckle, geraniums, myrtle, sweet briar, mignonette, russelias, euphorbiae, and passion flowers.

The prizes for indigenous fruits were awarded to Mr. J. Glass, Dr. Stuart, and Cleveland House mallees.

A present of twenty rupees, on being proposed by one of the Umpires, was immediately subscribed, and given to the mallees of the Society's Garden, as a reward for the satisfactory state of every thing under their charge.

A vote of thanks was given unanimously to the Umpires for the able discharge of their duties, and thus ended the first show of 1844-1845.

The following are the names of the New Subscribers since the 1st August last.

G. D. Turnbull, Esq., Civil Service, Azimghur.
Mr. W. Claxton, Kussowlee.
W. Dampier, Esq., Superintendent of Police, Lower Provinces.
Captain G. Scott, 6th Regiment, Light Cavalry.
J. H. Bridgman, Esq. Lehra, Gorruckpore.
C. K. Robison, Esq. of Calcutta.
Captain Elwall, Thuggee Department, Chupprah.
Lieut. W. J. H. Charteris, 2nd Oude Local Infantry.
A. W. MacLeod, Esq. Nauthpore, Purneah.
W. Gray, Esq. Nauthpore, Purneah.
A Arrouch, Esq. Planter, Rajmahl.
W. R. Jones, Esq. Butteral, Purneah.
E. J. C. Richardson, Esq. Civil service, Bhaugulpore.
Hajee Mirza Mahdee Spahannee, Calcutta.
D. MacLeod, Esq. Deputy Magistrate, Tirhoot.
Mufukhurool Moolk, Museer ooldowlah Nawab Syud Sufdur Ullly
Khan Bahadoor, Sufdur Jung of Killah Nizamut, Moorshedabad.
A. B. Fenwick, Esq. and Captain W. Kennedy 5th Regiment Native
Infantry.
Baboo Ram Udheen Sing Zumeendar, Tuppah Bhoorsah, Pergunnah
Furkah, Monghyr.
F. Gouldsbury, Esq. Sessions Judge, Bhaugulpore.
Baboo Grischunder Mokerjee.
Raja Byjnauth Narrain, Zumeendar of Talooka Sonebursu.
Shew Sahoy Sing, Zumeendar Talooka Nugurparah.

Donations since last Report.

1st. The sum of ten Rupees has been most kindly presented to the Society by Mrs. Ellerton.

2nd. From Dr. Wallich, Superintendent Hon'ble Company's Botanical Gardens, several packets of cuttings of rare plants, many of which arrived in excellent order, and a large assortment of plants delivered to the Secretary in Calcutta, which would have been a real acquisition to our garden, had not a storm near the mouth of the Bhaugeruttee upset the boat in which they were being conveyed towards Bhaugulpore. Dr. Wallich is however most kindly replacing the lost plants.

From Sir Lawrence Peel, some very rare and beautiful plants, likewise many other contributions from Messieurs C. K. Robison, A. Parker, J. and G. Wood, which with few exceptions were also lost in the wrecked boat.

From the Parent Society an assortment of cotton, munjeet, Nerbudda wheats, white linseed, pandanus vacoa, and some vegetable and other seeds. The Nerbudda wheat of three sorts, although a good deal perforated by the weevil, has germinated in part. It has excited considerable attention from the Zumeendars to whom it has been distributed, from its celan and large grain, in so much that from its apparent superiority over the wheats of this part of the country, it has been considered a boon even to receive a small packet by way of experiment on their lands. The white Nerbudda linseed promises much. and could it be introduced generally would likewise be of great benefit, from the pureness of its oil in comparison with that extracted from the red or common linseed of the country.

From Dr. Campbell, Superintendent of Darjeeling, some seed barley and five maunds of Darjeeling potatoes.

From Dr. Christie of Katmandoo, two sorts of wheat and some cuttings of the *Cereus triangularis*.

For the continued support afforded us by the great increase of new Subscribers, and for all the above handsome donations, the best thanks and acknowledgments of this our Branch Society are now accorded.

T. E. A. NAPLETON, *Secretary*.

P.S. The Society has also been presented with plants and seeds by Mr. G. F. Brown, Mr. J. Pontet, Mr. Finch, Mr. A. J. Lambe, Mr. Staniforth, Colonel Perasse, and Captain Don, to whom the Society is much indebted for their liberal contributions.

THIRD SHOW OF 1844-45.

On Saturday the 12th April 1845, an exhibition of vegetables, flowers, and agricultural produce took place in the Society's new show room in the public garden at 5 o'clock p. m. and was most numerously attended. The Lord Bishop of Calcutta and suite, together with several visitors from his Lordship's Steamer, honored the assembly with their presence.

In the agricultural department the samples of grain were in some instances very fine, but owing to little or no rain having fallen in this and the neighbouring districts since the middle of September last, the *tout ensemble* was inferior to last year's.

Amongst the public garden samples two were remarkably fine of their respective kinds, viz. white linseed and white gram; twenty-five seers of the former were grown upon about two cottahs of ground, and the superiority of this fine white linseed over the old red sort, has been acknowledged far and near, and the whole of the above seed will be distributed in this and the neighbouring districts for next season's sowings.

There were some fine samples of wheat, barley, gram, oats, safflower, &c. from the farms of several Zumeendars. A silver medal was awarded to George Barnes, Esq. of Bedaire, Colgong, for wheat, gram, &c. the produce of the Bedaire and Ekdarraha farms conjointly. The wheat sent from the latter farm by Mr. Turner, was pronounced first rate.

The competition for the second medal and several money prizes was deferred until the 30th May proximo, when there will be another Agricultural exhibition as well as a Fruit and Flower show, by which arrangements several Zumeendars and others who were prevented by sickness and other causes from attending the last show, will have an opportunity of being present.

In the vegetable department there was an unusually fine display for the season of the year. The following specimens, the produce of the Public Garden, attracted much attention, and the umpires expressed their highest approbation at the improved state of Horticulture in the Society's Garden.

Potatoes, asparagus, artichokes, mangul wurzul, heet root, red, Savoy, and drumhead cabbages, carrots, knole kole, leeks, love apples, and turnip cabbage comprised the chief specimens.

A severe hail storm which took place a few days before the exhibition, destroyed the celery crop.

Prizes were awarded to the mallees of the following gardens, they being the successful competitors.

Mr. G. F. Brown,	Cleveland House,
Mr. J. Pontet,	Molvee Mahomed Rafiq,
Mr. C. Stuart,	The Suddur Alla,
Mr. John Glass,	Shah Mayut Hoossain,
Mr. George Barnes,	Amanauth Ghose,
Baboo Gooroochurn Mitter,	Ubdullah Khan,

For the Floricultural Department there were some beautiful bouquets, but in consequence of the lateness of the evening, but few prizes were competed for.

The following specimens of the beauties of Flora were greatly admired.

The honeysuckle, woodbine, wax plant, geraniums of sorts, verbena, the amaryllis and passiflora families, heliotrope, myrtle, sweet-briar, carnations, pinks, roses of several sorts, cum multis aliis.

The Society has great pleasure in publishing the following list of new subscribers since the last report dated the 16th January 1845:—

Lieut. A. L. MacMullin, 23rd Regt. N. I. Dinapore.

Captain G. M. Sherer, H. C. Stud. Buxar.

Captain F. M. H. Burlton, Assistant H. C. Stud, Buxar.

William Moran, Esq. Mooteharree, Chumparun.

Dr. A. Grant, Civil Surgeon, Bhaugulpore.

John Gale, Esq. Pundoo, Durbungah, Tirhoot.

Colonel E. Garstin, Superintending Engineer Lower Provinces.

Chowdry Fugeerbux, a large Zumeendar of Furkeah.

Rajah Roodrah Nund Sing, a large Zumeendar of Furkeah.

Captain Wright, 1st Regt. N. I. Dinapore.

James H. Young, Esq. Magistrate of Bhaugulpore.

R. C. Raikes, Esq. C. S. Bhaugulpore.

George C. Barnes, Esq. Bedaire, Colgong.

Henry Page, Esq. Mooskypore, Monghyr.

T. Wilson, Esq. Ghazeepore.

Mecan Khan, Bhaugulpore.

Lootf Ullee, Bhaugulpore.

The following money and other donations have been received since our last Report:—

From Dr. A. Davidson, 10th Regiment Light Cavalry, a donation of sixteen Rupees.

From Rajah Bafah Gobind Sing Bahadoor, Hawlie Pergunnah, Purneah, a donation of one hundred Rupees.

From Rajah Roodrah Nund Sing of Bundelie, Purneah, a donation of one hundred Rupees.

A donation from G. C. Cheap, Esq. C. S. of a large assortment of grass seeds.

A donation of about a hundred geranium cuttings from Captain Don.

A present of some Hoya carnosa and Rose Plants from J. Piron, Esq.

A present of several packets of seeds from the Himalaya mountains, from A. Bell, Esq. M. D. and Captain Phillpotts 66th Regiment N. I.

A donation of twenty-five vines of esteemed sorts collected and presented by Captain Hockley, commander of the "Jellinghee" accommodation boat.

From Captain R. D. Kay, 2nd Grenadiers, Asst. Adjt. General, Dinapore division, a large and much prized assortment of Cape bulbous and tuberous roots.

From the Parent Society.

1. Seed of the American Sumach, *Cæsalpinia coriaria*.
2. Seed of the far-famed and beautiful *Cordia sebestena*, from Barbadoes.
3. Seed of the Granadilla from Barbadoes.
4. Seed of the water lemon from ditto.
5. Seed of the Soursop (*Anona muricata*,) from Barbadoes.
6. Seed of another species of *Anona* from Captain Burnett's garden at Dum-Dum.
7. Seed of the *Solandra oppositifolia*, from Ceylon (a beautiful shrub.)
8. A few vegetable seeds from the Cape, which are very acceptable for early sowings.

Several plants of heart's-ease, from C. J. Richards, Esq., Garden Reach, Calcutta.

A present of tulip, narcissus, jonquills, crocus, and other rare bulbs from Messrs. Veitch and Son, the Society's Seedsmen and Florists, the whole of which arrived in most excellent order per overland route.

From the Honorary Secretary, about five hundred rare cuttings and plants.

The Society has great pleasure in announcing that the following gentlemen have most kindly consented to become Honorary Joint-Secretaries at the stations specified opposite their respective names:—

R. F. Hodgson, Esq. C. S. for the Monghyr district.

W. St. Quintin, Esq, C. S. for the Gyah district, and during his absence on leave, E. Jenkins, Esq. Civil Service.

Captain H. Milne for the Ghazepore district.

The Honorable F. Drummond, C. S. for the Purneah district.

Walter Landall, Esq. of Lattypore, for the district due North of Bhaugulpore.

MY DEAR SIR,—In forwarding an account of our last Agri-Horti. and Floricultural exhibition, I have the honor to request you will submit it at your next general meeting for the information and approval of the Parent Society.

I remain, &c.

T. E. A. NAFLETON,

Bauglepore, 3d June, 1845.

Hon. Sec. B. B. A. H. and F. S.

FOURTH SHOW OF 1844-45.

An exhibition of Agri-Horti. and Floricultural produce took place on Friday evening, the 30th May 1845, in the Society's Show rooms, at 5 o'clock p. m. and was remarkably well attended, there being about seventy members of the Society, the ladies of the station, and a number of visitors present.

Mr. G. F. Brown, the Rev. J. MacCallum, Dr. Grant, and the Aga Sahib, having been elected umpires, proceeded to inspect the samples of grain, &c. in the Agricultural department, amongst which were some particularly fine specimens of wheat, barley, white gram, field peas, tobacco, oats, white linseed, cotton, and safflower, some of which were sent from Mozuffurpore in Tirhoot to compete for the prizes. After a careful examination of the whole, the umpires awarded a silver medal to George Barnes, Esq. for the superior produce of the Colgong estate, which however, that gentleman most properly declined receiving, having only at the show on the 12th ultimo won a similar prize. Next in the list came Rajah Oodit Narrain Sing, a large Zumeendar to the North of Bhaugulpore, to whom the medal was presented. Money prizes from Sir Lawrence Peel's annual and handsome donation to our Branch Society were also awarded to the following native gentlemen,—

Muddun Tackoor, Mahomed Majid, and Baboo Gooroochurn Mitter for the 2d and 3rd best samples of Agricultural produce.

Before proceeding further, it is but proper to notice the produce of the public garden which was laid out on the three tables, and consisted of

Three dalleses of very fine grapes, white, light red, and black, quite ripe and of excellent flavour.

A small dallee of peaches.

A basket of asparagus of unusually large growth, one of the heads having weighed fourteen Rupees, which was reared from seed received last October from our seedsmen, Messrs. Veitch and Son.

There was a large basket of Darjeeling potatoes (acclimated) which for fineness of skin, size, and healthy appearance, could not perhaps be surpassed in any part of the world, two baskets of carrots, two of red cabbage, onions, leeks, cucumbers, &c. the produce of Messrs. Veitch and Co's seed, were pronounced first rate. There was also a very fine show of flowers from the Society's garden, likewise some fine specimen of white linseed, white gram, wheat, acclimated American cotton and English oats.

In the Fruit department there were some baskets of remarkably fine peaches, Bombay mangoes, leeches, plantains, lemons, corounders, whampees, figs, bails or wood apples, alloo bokharas, &c. from the gardens

of Mr. J. Pontet,

Mr. J. Glass,

Mr. George Barnes,

Mr. T. Grant, of Narrainpore,

Mr. Gouldsbury,

Mr. P. Quadros,

Cleveland House,

The Suddur Alla,

Oomanauth Ghose,

Babo Gooroo Churn Mitter,

Gobind Suharee,

Waris Ullee,

Muddun Tackoor,

Shah Enayut Hoossan,

and several prizes were awarded to the Mallees of those gentlemen.

In the Floricultural department there was an excellent display of bouquets. Five sorts of roses in fine flower, heart's-ease, geraniums of nine sorts, honeysuckle, sweet briar, belladonna and amaryllis, lillies, myrtle, duranta plumieri, euphorbia, passion flowers, ixoras, double pinks, zinnias, abutilon striatum, cardamom, tecoma jaeaminoides, verbena, baubiniyas, coral plant, and we were happy to observe a far larger number than usual of bouquets of indigenous flowers, which were arranged with much taste, and interspersed with some very pretty roses and jasmine. This being the first occasion of heart's-ease having been brought to the show room, we must not omit to state that we are indebted to Mr. James Pontet for having introduced two of them in fine blossom, which were much admired.

Several prizes were awarded in this department to the Mallees of Captain Don, Mr. John Glass, Baboo Gooroo Churn Mitter, Baboo Oomanauth Ghose, Moulvee Mahomed Rafiq, and Cleveland House.

Vegetable Department.

Although it was not intended to have had an exhibition of vegetables on this occasion, a great number of dallee were sent, but the evening having closed in before they could be inspected the show therefore was adjourned till 6 o'clock the next morning, when a few members of the Society most kindly attended as umpires, and gave great satisfaction in the performance of their duty; a few prizes were awarded, and thus ended the last show of 1844-45.

The following is a list of donations to our Branch Society since the 12th April ultimo.

From Captain G. Scott, 6th Regiment Light Cavalry, Loodiana, a money donation of thirty-two rupees.

From W. Claxton, Esq. merchant, Loodiana, a fresh and most acceptable assortment of dhalia seed and dhalia tubers, together with some Scotch fir seed.

From Captain Tombs, A. D. C. to General Tombs, Saugor, a packet of English double dhalia seed, together with some acclimated dhalia seed from Mussoorie.

From Captain Don, a fine supply of geranium cuttings of sorts.

From Colonel Ouseley, Governor General's Agent, Chota Nagpore, eight plants of a most superior description of edible Date, indigenous to the province of Surgunja.

From W. St. Quintin, Esq. (a most zealous supporter of our branch Society) an assortment of seeds collected at Darjeeling. Mr. Quintin has intimated that he has been fortunate enough to meet with some rhododendron seedlings, lilly of the valley, bulbs, &c. and that he is making a collection of plants for our public garden.

From William Storm, Esq. a number of vines from his splendid garden near Calcutta.

From Dr. Wallich, Superintendent Honorable Company's Botanical Garden, a most acceptable batch of seeds.

From J. Gouldhawke, Esq. of Kant Nuggur, 2 plants of the wild strawberry.

We have the pleasure to publish the names of the following new subscribers since the 12th April ultimo :—

Charles Cave, Esq. Korah near Purneah.

Mirzah Mahomed Hoossan of Purneah.

J. Grant, Esq. Civil Service, Dinagepore.

C. Steer, Esq. Civil Service, Dinagepore.

A. G. MacDonald, Esq. Civil Service, Rungpore.

Goordial Sing of Bhaugulpore.

Ram Suhase Zumeendar of Chumpanugur, Bhaugulpore.

Shew Ram Austee of Bhaugulpore.

Rajah Beja Gobind Sing of Havalee, Pergunnah Purneah.

Kasee Ullee Bux of Monghyr.

Gpollam Ullee of Lokmanpore.

Auzum Khan of Lukur Dewanee.

Kaullepershaud of Puckee Surae.

Koodrut Ullee of Toopoul.

Doorgapershaud of Bhaugulpore.

Baboo Kunhyah Loll, Zumeendar of Bhaugulpore.

Moulvee Urfan Ullee of Bhaugulpore.

Since last report six bighas of ground have been added to the public garden solely for Agricultural purposes ; the ground has been divided into eight small fields, and they are intended for the reception of French and English oats, Nerbudda white linseed, Darjeeling and Madras potatoes, Nerbudda and other wheats, clover and trefoil, foreign tobacco and cotton, white gram, West India arrow root, mangul wurzul, Tennasserim yams, &c. &c.

The produce will be distributed amongst the supporters of our Branch Society, and through them to the Zumeendars and ryots of their respective districts.

With a view of introducing a better mode of ploughing in this district, several gentlemen have joined in the following sweepstakes :—

Bhaugulpore ploughing Match (Gentlemen Ploughers) to come off about the middle of November next, in a piece of ground attached to the Public Garden.

A sweepstakes of one Gold Mohur each for a ploughing Match, under the following rules.

The quantity of ground to be ploughed, to be decided on by the umpires ; competitors are at liberty to use English, Chinese, Indian, or ploughs of any foreign construction : the number of Bullocks or Horses to be used in each plough not to exceed a pair. The tests or merits of the ploughing to consist of the following essentials :

Depth, closeness, and straightness of furrow.

The winner entitled to two-thirds of the prize, the 2nd plough to the remainder. Six gentlemen have already entered themselves as subscribers to the above project.

The public tank on the left flank of the Society's garden has lately been lengthened eighty feet to the Eastward, and a ghaut of fifty feet in width is about to be built, and when these additions are completed, the best judges have given it as their opinion that this will be one of the most extensively useful and prettiest tanks in India. The perpendicular depth is twenty feet, the banks are prettily sloped and turfed, and two ghauts which are situated on the high road, will be available to the public ; and as there are some beautiful trees close to them, the traveller will here have the advantage of reposing under their shade and satisfying his thirst. The tank has a promenade about twenty feet broad on two sides of it, (the other two being entirely thrown open to the community at large) and weeping willows, with many other ornamental shrubs, have already been planted thereon ; and whilst on this subject it may not be amiss to mention that Beebee Choochun, the proprietress of the lands adjacent to the Society's garden, most liberally came forward

with a rent-free grant for the ground occupied by the tank and promenade; and it is but justice to add, that the best thanks of the community of Bhaugulpore are due to her for this act of generosity and disinterestedness.

Memorandum.

Since writing the above, it has been decided to have a ploughing match for Native as well as Gentlemen ploughers, and that both matches shall take place on the same day in November next.

A sweepstakes of two rupees each for all natives who like to enter a native plough with a pair of bullocks.

Native umpires to be appointed, who shall decide on the quantity of ground to be ploughed, the merits of the ploughing, and awarding the prizes.

Appointments of, or alterations in, the Honorary Joint-Secretaries since the 12th April last and up to the 30th May 1845.

The following gentlemen have most kindly undertaken the duties of the above office.

G. L. Martin, Esq. of the Civil Service for the Purneah division.

The Honorable F. Drummond for the Beerbhoom division.

THE AGRICULTURE OF DIFFERENT AGES AND COUNTRIES.

By CUTHBERT W. JOHNSON, Esq. F. R. S.

(From the Journal of Agriculture for March and October 1844.)

The state of mankind, in the earliest periods of their social existence, is commonly one of idleness. A scantily populated, fertile country, is ever distinguished for the rudeness of its cultivation and the comparative inferiority of its produce. In the first ages of mankind, and, in fact, in that of newly-peopled countries, the wants of the first settlers are usually too readily supplied to render much exertion necessary. The rich alluvial soils, fertile without manure, productive of the finest grass without labour, are the first spots on which the new comers locate themselves. These supply food for their live-stock, and corn and vegetables for the owner's family, with the least labour; and if the settler is not tempted, by the high price it bears, to grow more corn than is sufficient for his own wants, he devotes himself to the delights of the chase—his gun, his fisheries, his dogs, supply him with abundance of game, with his food, and with skins for his clothing.

Thus employed, thus readily supported, it need hardly surprise us that, in the rudest state, these occupations are ever regarded as the only occupations worthy of man, and that to the weaker sex is committed the care of the garden and the cultivation of the field. The foresight exercised in these matters, by such primitive cultivators, is ever in keeping with the rest of their proceedings. Thus the islanders of the Southern Ocean, being devoid of tools, were accustomed to destroy by fire the noblest trees, to produce a wretched unwieldy canoe. To acquire the fruit of the bread-tree, the natives had no better expedient than to burn the tree down; and when the Orientalists found out the advantages of growing corn, it was long before they discovered a mode of thrashing it. To tread it out by the feet of oxen was regarded as the most reasonable way of separating it from the straw—a plan still followed even in Portugal. The progress of agricultural implements betrays the same indolence and carelessness. The plough, for instance, in some rude form or other, is an agricultural implement of remote antiquity; but it was long used of such a form as produced bad work, and very unnecessary labour to the poor beasts who were fated to draw it along. Plough-harness was another difficult question, which long puzzled the primitive cultivators of the soil. Thus the poor Irish boors for ages fastened their horses to the plough by their tails, and when, at last, an act of the Irish Parliament prohibited the barbarism, it was regarded by the then tillers of the soil as an interference of the legislature totally uncalled for. It was said to be an act which violated that freedom of action, and was an interference with that great march of experimental improvement, for which our gallant neighbours have ever been so desirous. It will be, perhaps, an interesting, and, at the same time, a research affording us some instruction, if, previously to entering upon an examination of the different systems of agriculture, produced by the effects of soil and climate, I repeat and enlarge upon what I have, in another place, had occasion to observe upon the farming operations of distant ages.

We have but little information to guide us as to the country in which man first cultivated the soil; nor of that in which he first settled after the Deluge. Thus much, however, is certain, that we have the earliest authentic account of the state of agriculture as it existed among the Egyptians and their bondservants, the Israelites. From the former the Greeks were probably descended. The Romans, at a later period, were a colony from Greece; and from the Romans the other countries of Europe derived their earliest marked improvement in the arts. My brief history of the progress of agriculture, then, will be divided into,

1st, The Agriculture of the Egyptians and other Eastern Nations ; 2nd, The Agriculture of the Greeks ; 3rd, The Agriculture of the Romans.

I.—The Agriculture of the Early Eastern Nations.

Every family of these primitive nations had its appointed district for pasturage, if it pursued a pastoral life ; or its allotted inclosure, if it was occupied by tilling the earth. There was no distinction in this respect between the monarch and his people ; each had a certain space of land from which he and his family were to derive their subsistence. The Egyptians, as well as the Israelites, were flock-masters. The latter were particularly so ; and, as Joseph's brethren said to Pharaoh, "their trade was about cattle from their youth." (*Gen.* xlv. 34.) When, therefore, they came into Egypt, they desired the low-lying land of Goshen, as producing the most perennial of pasture. (*Gen.* xlvii. 4.) It is true that the same authority says "every shepherd is an abomination unto the Egyptians ;" but this was because, about a century before the arrival of Joseph among them, a tribe of Cushite shepherds from Arabia had conquered their nation, and held them in slavery ; till, after a sanguinary contest of thirty years, they regained their liberty about twenty-seven years before Joseph was promoted by Pharaoh. That the Egyptians were flock-masters is certain from many parts of the Scriptures. Thus, when Pharaoh gave permission to the Israelites to dwell in Goshen, he added, as he spoke to Joseph, "And if thou knowest any men of activity among them, then make them rulers over my cattle," (*Gen.* xlvii. 6 ;) and when the murrain came into Egypt, it was upon their "horses, asses, camels, oxen, and sheep." (*Exod.* ix. 3.) The attention and care necessary to be paid to their domestic animals were evidently well known and attended to ; for when they proposed to settle in a land, their first thought was to build "sheep-folds for their cattle." (*Numb.* xxxii. 16.) They had stalls for their oxen (*Hab.* iii. 17,) and for all their beasts. Thus, King Hezekiah is said to have made "stalls for all manner of beasts, and cotes for flocks ; moreover, he provided him possessions of flocks and herds in abundance," (*2 Chron.* xxxii. 28 ;) and that this abundance exceeded the possessions of the greatest of our modern flock-masters, we may readily acknowledge, when we read that "Mesha, King of Moab, was a sheep-master, and rendered unto the King of Israel 100,000 lambs and 100,000 rams, with the wool." (*2 Kings* iii. 4.)

They prepared the provender for their horses and asses of chaff, or cut straw and barley. (*Judges* xix. 21 ; *1 Kings* iv. 28.) Our translation does not explicitly state this, but it is clear in the Hebrew original.

(*Dr. Kennicott's Codex*, xxiv; *Harmer's Observations*, i. 423.) It is also certain, from the Hebrew original, that they tied up calves and bullocks for the purpose of fattening them, (*Jerem.* xlvi. 21; *Amos* vi. 4, &c.; *Parkhurst's Hebrew Lexicon*, 673;) and that they were acquainted with the arts of the dairy. "Surely the churning of milk," says Solomon, "bringeth forth butter," (*Prov.* xxx. 31;) and Samuel speaks of the "cheese of kine." (2 *Sam.* xxvii. 29.) The chief vegetable products cultivated by these eastern nations, were wheat, barley, beans, lentils, rye, the olive, and the vine. (*Exod.* ix. 31; *Levit.* xix. 10; 2 *Sam.* xvii. 28, &c.)

The scanty notices which we have of their tillage, gives us no reason to doubt that they were skilful husbandmen. Their name for tillage (*Obed*) emphatically expresses their idea of it; for it literally means *to serve the ground*. (*Parkhurst*, 508.) And that the cares and attention necessary were well sustained, is evidenced by the fact that David, for his extensive estate, had an overseer for the storehouses in the fields; another over the tillage of the ground; a third over the vineyards; a fourth over the olive trees; two to superintend his herds: a seventh over his camels; an eighth to superintend his flocks; and a ninth to attend similarly to the asses. (1 *Chron.* xxvii. 25—31.) Of their ploughing, we know that they turned up the soil in ridges, similarly to our own practice; for the Hebrew name of a husbandman signifies a man who does so. (*Parkhurst*, 93.) That they ploughed with two beasts of the same species attached abreast to the plough, (*Deut.* xxii. 10.) That the yoke, or collar, was fastened to the neck of the animal; and that the plough, in its mode of drawing the furrows, resembled our own; for we read of their sharpening the coulter and the ploughshare. (1 *Sam.* xiii. 20, &c.) Ploughing was an operation that they were aware might be beneficially performed at all seasons; for Solomon mentions it as a symptom of a sluggard, that he will not plough in the winter, (*Prov.* xx. 4;) and that too much care could not be devoted to it, they expressed by deriving their name for ploughing from a Hebrew root, which signifies *silent thought and attention*. (*Parkhurst*, 244.)

Their sowing was broadcast, from a basket, (*Amos* xi. 13; *Psalms* cxxvi. 6;) and they gave the land a second superficial ploughing to cover the seed. It is true that harrowing is mentioned in our translation, (*Job* xxxix. 10;) but Schultens and other Hebraists agree that harrowing was not practised by them. Russell, in remarking upon the mode of cultivation now practised near Aleppo, says, "No harrow is used, but the ground is ploughed a second time after it is sown, to cover the grain." (*Parkhurst*, 720.) The

after cultivation apparently was not neglected : they had hoes or mattocks which they employed for extirpating injurious plants. "On all hills," says the prophet, "that shall be digged with the mattock, there shall not come thither the fear of briars and thorns." (*Isa.* vii. 25.) In those hot climates a plentiful supply of moisture was necessary for a healthful vegetation ; and the simile of desolation, employed by the same prophet, is "a garden that hath no water." (*Isa.* i. 30.) In Egypt they irrigated their lands ; and the water thus supplied to them was raised by a hydraulic machine, worked by men in the same manner as the modern tread-wheel. To this practice Moses alludes, when he reminds the Israelites of their sowing their seed in Egypt, and watering it with their feet, a practice still pursued in Arabia. (*Deut.* xi. 10 ; *Niebuhr, Voyage en Arabie*, i. 121.)

When the corn was ripe, it was cut with either a sickle or a scythe, (*Jer.* i. 16 ; *Joel* iii. 13,) was bound into sheaves, (*Psaln* cxxix. 7 ; *Deut.* xxiv. 19, &c.,) and was conveyed in carts, (*Amos* ii. 13,) either immediately to the thrashing-floor or to the barn. They never formed it into stacks as we do. These passages in the Scriptures, (*Exod.* xxii. 6 ; *Jud.* xv. 5 ; *Job* v. 26) refer exclusively to the thraves or shocks in which the sheaves are reared as they are cut. (*Harmer's Observ.* iv. 145, &c.) The thrashing-floors, as they are at the present day, were evidently level plats of ground in the open air. (*Jud.* vi. 37 ; *2 Sam.* xxiv. 18—25, &c.) They were so placed that the wind might, at the time of the operation, remove the chief part of the chaff. They perhaps had thrashing-floors under cover, to be used in inclement seasons ; for Hosea, (ii. 35,) speaking of "the summer thrashing-floors," justifies such a surmise. The instruments and modes of thrashing were various. They are all mentioned in these two verses of the prophet : "Fitches are not thrashed with a thrashing instrument, neither is a cart-wheel turned upon the cummin ; but the fitches are beaten out with a staff, and the cummin with a rod. Bread-corn is bruised because he will not ever be thrashing it, nor break it with the wheel of his cart, nor bruise it with his horsemen." (*Isaiah* xxviii. 27, 28.) When the seed was thrashed by horses they were ridden by men ; and when by cattle, although forbidden to be muzzled, (*Deut.* xxv. 4,) yet they were evidently taught to perform the labour. (*Hosea*, x. 11.) The "instrument" was a kind of sledge, made of thick boards, and furnished underneath with teeth of iron. (*Isaiah* xli. 15 ; *Parkhurst*, 242, 412.) The revolving wheels of a cart, and the various sized poles employed for the same purpose, need no further comment. To complete the dressing of the corn, it was passed through a sieve, (*Amos* ix. 9,) and thrown up

against the wind by means of a shovel. The fan was, and is still, unknown to the Eastern husbandmen; and where that word is employed in our translation of the Scriptures, the original seems to intend either the wind or the shovel." (*Isaiah xxx. 24*; *Jer. xv. 7*; *Parkhurst*, 183, 680.)

Of their knowledge of manures we know little. Wood was so scarce that they consumed the dung of their animals for fuel. (*Parkhurst*, 764.) Perhaps it was this deficiency of carbonaceous matters for their lands that makes an attention to fallowing so strictly enjoined. (*Levit. xix. 23, xxv. 3*; *Hosea, x. 12, &c.*)

The landed estates were large, both of the kings and of some of their subjects; for we read that Uzziah, King of Judah, "had much both in the low country and in the plains; husbandmen, also, and vine-dressers in the mountains and in Carmel, for he loved husbandry," (2 *Chron. xxvi. 10*;) that Elijah found Elisha with twelve yoke of oxen at plough, himself being with the twelfth yoke, (1 *Kings xix. 19*;) and that Job, the greatest man of the East had 14,000 sheep, 6,000 camels, 1,000 yoke of oxen, and 1,000 she asses. (*Job i. 3*; *xliii. 12*.) Even in the time of Isaiah, the accumulation of landed property, in the hands of a few proprietors, was so much on the increase, that a curse was uttered against this engrossment. "Wo unto them," says the prophet, "that join house to house, that lay field to field, till there be no place, that they may be placed alone in the midst of the earth." (*Isaiah v. 8*.)

II—The Agriculture of the Greeks.

Agriculture was too important and too beneficial an art not to demand, and the Greeks and Romans were nations too polished and discerning not to afford to it, a very plentiful series of presiding deities. They attributed to Ceres, as their progenitors, the Egyptians, did to Isis, the invention of the arts of tilling the soil. Ceres is said to have imparted these to Triptolemus of Eleusis, and to have sent him as her missionary round the world to teach mankind the best modes of ploughing, sowing, and reaping. In gratitude for this, the Greeks, about 1356 years before the Christian era, established, in honour of Ceres, the Eleusinian mysteries, by far the most celebrated and enduring of all their religious ceremonies; for they were not abolished at Rome until the close of the fourth century. Superstition is a prolific weakness, and consequently, by degrees, every operation of agriculture, and every period of the growth of plants, obtained its presiding and tutelary deity. The goddess *Terra* was the guardian of the soil; *Stercutius*

presided over manure; *Volutia* guarded the crops whilst evolving their leaves; *Flora* received the still more watchful duty of sheltering their blossom; they passed to the guardianship of *Lactantia* when swelling with milky juices; *Rubigo* protected them from blight; and they successively became the care of *Hostilina* as they shot into ears; of *Matura* as they ripened; and of *Tutelina* when they were reaped. Such creations of Polytheism are fables it is true, yet they most please by their elegance, and much more when we reflect that it is the concurrent testimony of anterior nations, through thousands of years, that they detected and acknowledged a Great First Cause.

Unlike the arts of luxury, agriculture has rarely, if ever, been subject to any retrograde revolutions. Being an occupation necessary for the existence of mankind in any degree of comfort, it has always continued to receive their first attention; and no succeeding age has been more imperfect, but in general more expert, in the art than that which has preceded it. The Greeks are not an exception to this rule; for their agriculture appears to have been much the same in the earliest brief notices we have of them, as the husbandry of the nation of which they were an offset. The early Grecians, like most new nations, were divided into but two classes—landed proprietors, and helots or slaves; and the estates of the former were little larger than were sufficient to supply their respective households with necessaries. There was, probably, not even a prince or leader of the Greeks who did not, like the father of Ulysses, assist with his own hands in the operations of the farm. (*Odys.* i. xxiv.) Hesiod is the earliest writer who gives us any detail of the Grecian agriculture. He appears to have been the contemporary of Homer, and, in that case, to have flourished about nine centuries before the Christian era. His practical statements, however, are very meagre. Xenophon died at the age of ninety, 359 years before the birth of Christ. The following narrative, if not otherwise specified, is taken from his *Œconomics*. In his times, the landed proprietor no longer lived upon his farm, but had a steward, as a general superintendent, and numerous labourers, yet he always advises the master to attend to his own affairs. "My servant," he says, "leads my horse into the fields, and I walk thither for the sake of exercise in a purer air; and when arrived where my workmen are planting trees, tilling the ground, and the like, I observe how everything is performed, and study whether any of these operations may be improved." After his ride, his servant took his horse and led him home, "taking with him," he adds, "to my house, such things as are wanted; and I walk home, wash my hands, and dine, of whatever

is prepared for me, moderately." "No man," he continues, "can be a farmer till he is taught by experience; observation and instruction may do much, but practice teaches many particulars which no master would ever have thought to remark upon." "Before we commence the cultivation of the soil," he very truly remarks, "we should notice what crops flourish best upon it, and we may even learn from the weeds it produces what it will best support. Fallowing or frequent ploughing in spring or summer is of great advantage." And Hesiod advises the farmer (*Works and Days*, 50) always to be provided with a spare plough, that no accident may interrupt the operation. The same author directs the ploughman to be very careful in his work. "Let him," he says, "attend to his employment, and trace the furrows carefully in straight lines, not looking around him, but having his mind intent upon what he is doing." (*Ibid*, 441-443.)

Theophrastus evidently thought that the soil could not be ploughed and stirred about too much, or unseasonably; for the object is to let the earth feel the cold of winter and the sun of summer, to invert the soil, and render it free, light and clear of all weeds, so that it can most easily afford nourishment. (*De Causis Plant.*, lib. iii., c. 2, 6.) Xenophon recommends green plants to be ploughed in, and even crops to be raised for the purpose; "for such," he says, "enrich the soil as much as dung." He also describes the properties which render dung beneficial to vegetation, and he also dwells upon composts. (*Hist. of Plants*, ii., c. 8.) Xenophon recommends the stubble at reaping time to be left long, if the straw is abundant, "and this, if burned, will enrich the soil very much, or it may be cut and mixed with the dung." "The time of sowing," he adds, "must be regulated by the season, and it is best to allow seed enough."

Weeds were, even then, carefully eradicated from amongst their crops; "for, besides the hindrance they are to the corn, or other profitable plants, they keep the ground from receiving the benefit of a free exposure to the sun and air." Homer describes Laertes as hoeing when found by his son Ulysses. (*Odys.* xxiv., 226.) Water courses were made to drain away "the wet, which is apt to do great damage to corn."

Homer describes the mode of thrashing corn by the trampling of oxen, (*Iliad* xx., 495, &c. ;) and, to get the grain clear from the straw, Xenophon observes, "The men who have the care of the work, take care to shake up the straw as they see occasion, flinging into the way of the cattle's feet such corn as they observe to remain in the straw." From this author, and from Theophrastus, we can also make out that

the Greeks separated the grain from the chaff by throwing it with a shovel against the wind.

III.—*The Agriculture of the Romans.*

It is certain that, at a very early age, Italy received colonies from the Pelasgi and Arcadians, and that, consequently, with them the arts of Greece were introduced; and we may conclude that there was then a similarity in the practice of agriculture in the two countries. About 753 years before the nativity of Christ, Romulus founded the city of Rome, whose inhabitants were destined to be the conquerors and the improvers of Europe. The Roman Eagle was triumphant in Egypt, Persia, Greece, Carthage, and Macedon; and the warriors who bore it on to victory, in these and other countries, being all possessors of land of a larger or smaller extent, naturally introduced, upon their return, any superior vegetable or improved mode of culture which they observed in the more civilized seats of their victories. Thus the arts of Rome arrived at a degree of superiority that was the result of the accumulated improvements of other nations; and, finally, when Rome became, in turn, the conquered, the victors became acquainted with this store of knowledge, and diffused it over the other parts of Europe. Of the agriculture of the early Romans we know but little; but of its state, during the period of their greatest prosperity and improvement, we have fortunately very full information. Cato in the second, and Varro in the first century before the Christian era, Virgil at the period of that event, Columella and Pliny but few years subsequently, and Palladius in the second and fourth century each wrote a work upon agriculture, which, with the exception of that by Columella, has come down to us entire.

1. *Size of the Roman Farms.*—When Romulus first partitioned the lands of the infant state among his followers, he assigned to no one more than he could cultivate. This was a space of only two acres. (*Varro*, i. 10; *Pliny*, xvii. 11.) After the kings were expelled, seven acres were allotted to each citizen. (*Pliny*, xviii. 3.) Cincinnatus, Curius Dentatus, Fabricius, Regulus, and others distinguished as the most deserving of the Romans, had no larger estates than this. Cincinnatus, according to some authorities, possessed only four acres. (*Ibid.*; *Columella*, i. 3, &c.) On these limited spaces they dwelt, and cultivated them with their own hands. It was from the plough that Cincinnatus was summoned to be dictator, (*Livy*, iii. 26;) and the Samnian ambassadors found Curius Dentatus cooking his own repast of vegetables in an earthen vessel. (*Plutarch in vita Cato. Cens.*)

Some of the noblest families in Rome derived their patronymic names from ancestors designated after some vegetable, in the cultivation of which they excelled, as in the examples of the Fabii, Pisones, Lentuli, Cicerones, and the like. (*Pliny*, xviii. 1.) In those days, "when they praised a good man, they called him an agriculturist and a good husbandman; he was thought to be very greatly honoured who was thus praised." (*Cato in Præf.*) As the limits of the empire extended and its wealth increased, the estates of the Roman proprietors became very greatly enlarged; and, as we shall see more particularly mentioned in our historical notices of gardening, attained to a value of £80,000. (*Plutarch in vit. Marius et Lucullus.*) Such extensive proprietors let portions of their estates to other citizens, who, if they paid for them a certain rent, like our modern tenants, were called *Coloni* (*Columella*, i. 7; *Pliny Epist.* x. 24) and *Politores*, or *Partiarii*, if they shared the produce in stated proportions with the proprietor. (*Pliny Epist.* vii. 30, and ix. 37, &c.) Leases were occasionally granted, which appear to have been of longer duration than five years. (*Ibid.* ix. 37.)

2. *Distinction of Soils.*—Soils were characterized by six different qualities, and were described as rich or poor, free or stiff, wet or dry. (*Colum.* ii. 2.) The best soil they thought had a blackish colour, was glutinous when wet, and friable when dry; exhaled an agreeable smell when ploughed, imbibed water readily, retaining a sufficiency, and discharging what was superfluous; not injurious to the plough irons, by causing a salt rust; frequented by crows and rooks at the time of ploughing; and, when at rest, speedily covered with a rich turf. (*Virgil, Geor.* ii. 203, 217, 238, 248; *Pliny*, xvii. 5.) *Vines* required a light soil, *corn* a heavy, deep, and rich one. (*Virg. Georg.* ii. 29; *Cato*, vi.)

3. *Manures.*—The dung of animals was particularly esteemed by the Romans for enriching their soil. "Study," says *Cato*, "to have a large dunghill." (*Cato*, v.) They assiduously collected it and stored it in covered pits, so as to check the escape of the drainage. (*Colum.* i. 6; *Pliny*, xvii. 9, and xxiv. 19.) They sowed pulverized pigeon's dung, and the like, over their crops, and mixed it with the surface soil by means of the sacle or hoe. (*Colum.* i. 16; *Cato*, xxxvi.) They were aware of the benefit of mixing together earth of opposite qualities, (*Ibid.*,) and of sowing lupines and ploughing them in while green. (*Varro*, i. 23.) They burnt the stubble upon the ground, and even collected shrubs and the like for the similar purpose of enriching the soil with their ashes. (*Virgil Geor.* i. 84; *Pliny*, xvii. 6, 25.) *Pliny* also mentions that lime was employed as a fertilizer in Gaul, and marl in the same country and

Britain; but we can only surmise thence that they were also probably employed by the Romans. (*Pliny*, xvii. 8. and xvii. 5.)

4. *Draining*.—The superfluous water of soils was carried off by means both of open and covered drains. (*Colum.* ii. 2, 8; *Pliny*, xvii. c.; *Virg. G.* i. 109.) Cato is very particular in his directions for making them. (*Cato*, xliii. clx.)

5. *Crops*.—They cultivated wheat, spelt, barley, oats, flax, beans, pease, lupines, kidney beans, lentils, tares, sesame, turnips, vines, olives, willows, and the like. To cite the authorities who mention each of these would be needless, for they are noticed in all the Roman writers upon agriculture. Of the relative importance or proportion in which the crops were profitable to the Romans, we have this judgment of Cato: "If you can buy 100 acres of land in a very good situation, the vineyard is the first object if it yields much wine; in the second place a well watered garden; in the third a willow plantation; in the fourth an olive ground; in the fifth a meadow; in the sixth corn ground; in the seventh an underwood; a plantation yielding stout poles for training the vine; and in the ninth a wood where mast grows." (*Cato*, i.) They made hay, and the process appears to have been the same as in modern times. After being cut, it was turned with forks, piled into conical heaps, and finally into stacks or under cover. But the mowing was imperfectly performed; for, as soon as the hay was removed from the field, the mowers had to go over it again. (*Varro*; *Colum.* ii. 22.)

6. *Implements*.—The plough consisted of several parts: the beam to which the yoke of the oxen was fastened; the tail or handle terminated in a cross bar, with which the ploughman guided the instrument; it had a ploughshare, the share-beam to which it was fixed, and two mould-boards, a coulter, and a ploughstaff for cleaning the ploughshare. (*Ovid. Pont.* i. 8, 57; *Virg. G.* i. 170; *Pliny*, xvii. 18, 19.) Some of their ploughs had wheels, and some were without coulters and earth-boards. Besides this, they had spades, rakes, hoes, with plain and with forked blades, harrows, mattocks, and similar implements.

7. *Operations*.—*Ploughing* was usually performed by two oxen, though three were sometimes employed. They were yoked abreast, and trained when young to the employment. (*Cicero in Ferr.* iii. 21; *Col.* vi. 2, 10; *Pliny*, xviii. 18; *Virg. G.* iii. 163, &c.) They were usually yoked by the neck, but sometimes by the horns. (*Pliny*, viii. 45; *Colum.* ii. 2.) There was but one man to a plough, which he guided, and managed the oxen with a goad. (*Pliny, Epist.* viii. 17.) They sometimes ploughed in ridges, and sometimes not. They did not take a circuit

when they came to the end of the field, as is our practice, but returned close to the furrow. They were very particular in drawing straight and equal sized furrows. (*Pliny*, xviii. 19, s. 49.) They seem to have ploughed three times always before they sowed, (*Varro*, i. 29;) and to stiff soils, even as many as nine ploughings were given. (*Virg. G. i. 47*; *Pliny*, xviii. 20; *Pliny*, *Epist.* v. 6.) The furrows in the first ploughing were usually nine inches deep. When the soil was only stirred about three inches, it was called *scarification*. (*Pliny*, xviii. 17—19.) They usually fallowed their land every other year. (*Virg. G. i. 71.*)

Sowing was performed by hand, from a basket; and that it might be performed regularly, the hand moved with the steps. (*Colum.* ii. 9; *Pliny*, xviii. 24.) The seed was either scattered upon the land and covered by means of rakes and harrows, or more commonly by sowing it upon a plain surface, and covering by a shallow ploughing, which caused it to come up in rows, and facilitated the operation of hoeing. (*Pliny*, xviii. 20.) They were particular as to the time of sowing, the choice of seeds, and the quantity sown. (*Varro*, i. 44; *Pliny*, xviii. 24, s. 55; *Virg. G. i. 193*, &c.)

Weeding was performed by hoes, hooks, and by hand. In dry seasons the crops were watered. (*Virg. G. i. 106.*) If they appeared too luxuriant they were fed off. (*Ibid.* 193.)

Reaping and Mowing were the usual modes of cutting down the corn crops, but the ears were sometimes taken off by a toothed machine, called *batillum*, which seems to have been a wheeled cart, pushed by oxen through the corn, and catching the ears of corn between a row of teeth fixed to it, upon the principle of the modern daisy rake. In Gaul, the corn was cut down by a machine drawn by two horses. (*Varro*, i. 50; *Virg. G. i. 317*; *Colum.* ii. 21; *Pliny*, xviii. 30.) They do not seem to have ever bound their corn into sheaves. (*Colum.* ii. 21.)

Threshing was performed by the trampling of oxen and horses, by flails, and by means of sledges drawn over the corn. (*Pliny*, xvii. 30; *Colum.* ii. 21; *Virg. G. iii. 132*; *Tibullus*, i. 5, 22; *Varro*, i. 52.) The threshing floor was circular, placed near the house, on high ground, and exposed on all sides to the winds. It was highest in the centre, and paved with stones, or more usually with clay, mixed with the lees of the oil, and very carefully consolidated. (*Colum.* i. 6; *Varro*, i. 2; *Virg. G. i. 178*; *Cato*, xci. and cxxix.)

Dressing was performed by means of a sieve or van, and by a shovel, with which it was thrown up and exposed to the wind. (*Varro*, i. 52; *Colum.* ii. 21.) It was finally stored in granaries or in pits, where it would keep fifty years. (*Pliny*, xviii. 30; *Varro*, i. 57.)

8. *Animals*.—Oxen, horses, asses, mules, sheep, goats, swine, hens, pigeons, pea-fowls, pheasants, geese, ducks, swans, guinea-fowls, and bees, are mentioned by various authors as products of the Roman farms. Directions for breeding many of these are given in the third and fourth books of the *Georgics*.

Such is an outline of the Roman agriculture; and in it our readers will doubtless find sufficient evidence to warrant them in agreeing with us, that it was but little different from that pursued by the present farmers of England. We are superior to them in our implements, and consequently in the facility of performing the operations of tillage; we perhaps have superior varieties of corn, but we most excel them in our rotation of crops, and in the management of stock. We differ from them, also, in not practising the superstitious rites and sacrifices which accompanied almost all their operations, (see *Cato*, cxxxiv. c. ;) but of the fundamental practices of agriculture they were as fully aware as ourselves. No modern writer could lay down more correct and comprehensive axioms than Cato did in the following words; and whoever strictly obeys them will never be ranked among the ignorant of the art. "What is good tillage?" says this oldest of the Roman teachers of agriculture. "To plough. What is the second? To plough. The third is to manure. The other part of tillage, is to sow plentifully, to choose your seed cautiously, and to remove as many weeds as possible in the season." (*Cato*, 61.)

Such is a rapid sketch of their agricultural knowledge—a knowledge which has since increased, and will be certainly added to by attending to the advice of another of their writers. "Nature," he observes, "has shewn to us two paths which lead to a knowledge of agriculture—experience and imitation. Preceding husbandmen, by making experiments, have established many maxims, their posterity generally imitate them; but we ought not only to imitate others, but make experiments, not directed by chance, but by reason." (*Varro*, i., 18.)

In a preceding page of this Journal I have endeavoured to trace a few of the earliest agricultural improvements made by the nations of antiquity. These, we have seen, were at first exceedingly rude; for then, the population being but limited, only the richest natural soils were required to be cultivated, and nature was too bountiful in her gifts, and man, resident in an oriental atmosphere, far too indolent, to be either an active or an enterprising cultivator of the land: hence we find that, as the population of the earth increased, slaves were on most occasions made to do the work of the farm; and, moreover, all kinds of expedients were adopted to avoid manual labour—the patient bullock trod out the corn which more northerly nations, in a later age, sepa-

rated with the flail. Every thing else seemed in keeping with this Asiatic indolence. They rarely manured their soils—the irrigation system was a substitute for other modes of fertilizing the land—since, when once the reservoirs and channels, necessary for this valuable agricultural operation were made, the water glided on to the land, without the assistance of the owner.

Irrigation, also, supplied in a great measure the incessant loss of moisture occasioned by the heat of the climate—a temperature, too, which rendered it most to the farmer's interest to cultivate only particular plants; and this effect of temperature upon his crops, as poorer soils were gradually forced into cultivation, the farmer soon perceived was very materially influenced by various circumstances occurring even in the same climate, such as by the nature of the soil, its declination, and by its elevation above the level of the sea. In tracing a few of these causes of varying modes of cultivation, I shall have occasion, in a portion of this paper, to repeat and enlarge upon what I have in another valuable periodical work, (*British Farmer's Magazine*,) some time since, had occasion to observe. The effects produced by these circumstances are chiefly to be attributed to the difference of temperature produced by change of latitude, or elevation, or declination, upon the crop which is attempted to be cultivated—an effect of whose importance indeed a very casual glance at the plants natural to the soils dispersed over the surface of the globe will serve to convince the intelligent farmer. Such a brief review was long since made, nearly in the following language, by M. Mirbel:—There are, however, many very considerable local advantages besides those I have mentioned, such as the proximity of mountains, of forests, of the sea, &c., &c., which are all causes of variation of temperature, and must each be attended to in accounting for the natural vegetation and the *cultivated* crops of any particular district. For instance, the winter is less severe on the northern coasts of France than in the interior on the same level, an effect produced by the vicinity of the ocean; for the sea preserves a far more even temperature than the atmosphere, and is constantly at work to maintain some degree of equilibrium in the warmth of the air. In the summer it carries off a portion of the caloric from it; in the winter it gives back a part of that which it contains. It is thus that the mass of water held in the vast basin of the ocean tempers on its coasts the heat of summer and the cold of winter. For this reason, in Devonshire, and on the opposite coast of France, the myrtle, fuschia, magnolia, pomegranate, Indian rose, and a swarm of other exotic plants, grow in the open air; but in the interior of England and France require shelter. The same cause permits the cultivation of many spe-

cies in the open grounds about London, that near Paris will not do without a greenhouse.

In proportion as the natural temperature of a country decreases, as we advance towards the pole for instance, we are sensible of the change in the appearance of the vegetation. The species which require a mild and temperate climate are supplanted by others which delight in cold. The forests fill with pines, fir, and birches, the natural decoration of a northern land. The birch, of all trees, is the one that bears the severity of the climate the longest; but the nearer it approaches the pole the smaller it grows: its trunk dwindles and becomes stunted, and the branches knotty, till at last it ceases to grow at all towards the 70th degree of latitude, the point where man gives up the cultivation of corn. Further on, shrubs, bushes, and herbaceous plants only are to be met with. Wild thyme, daphnes, creeping willows, and brambles, cover the face of the rocks. It is in these cold regions that the berries of the *Rubus arcticus* acquire their delicious flavour and perfume. Shrubs disappear in their turn. They are succeeded by low herbs, furnished with leaves at the root, from the midst of which rises a short stalk surmounted by small flowers. Such are the saxifrages, the primroses, the *androsaces*, *aretias*, &c. These pretty plants take up their quarters in the clefts of rocks, while the grasses, with their numerous slender leaves, spread themselves over the soil, which they cover as with a rich verdant carpet. The lichen, which feeds the rein-deer, sometimes mixes in the turf, sometimes of itself covers vast tracts of country, its white tufts standing in clumps of various forms, looking like hillocks of snow, which the sun has not yet dissolved. If we go farther, a naked land, sterile soil, rocks, and eternal snows, are all we find. The last vestiges of vegetation are some *byssi* and some lichens which cover the rocks in motley patches.

The principal causes which induce this progression of changes are three:—1. The excess of duration in the winter, a consequence of the obliquity and disappearance of the solar rays. 2. The dryness of the air, a consequence of the decrease of heat. 3. The prolonged action of the light, which illumines the horizon through the whole period of vegetation.

It is well known that too great a degree of cold, by congealing the sap, occasions the rupture of the vascular system in plants, and thereby destroys them; but the deleterious action of cold is not confined to purely mechanical results, it has been proved that heat is a stimulus that cannot be dispensed with in vegetation. Many species secrete juices in warmer regions which are unknown in their economy in colder climates. The ash yields manna in Calabria, but loses that

faculty as it approaches towards the north. The grape in the south of Europe abounds in matter of a sweet quality ; in the north it contains an excess of acid. So long as the organic functions which depend upon the degree or duration of heat can be carried on, the ash and the vine continue to grow—they grow even when those functions are performed incompletely, but their growth is stunted. They finally disappear at that point where the portion of warmth in the atmosphere, though still equal to prevent the freezing of the sap, is no longer able to stimulate their organs or their frame into action.

All other vegetables, whose dimension and duration subject them to the full severity of the frost, share the same destiny, at a greater or less distance from the torrid zone, and in proportion as their constitutions require a greater or less degree of heat ; so that nothing is found near the pole but such dwarf shrubs as are sheltered under the snow in winter, or annuals and herbaceous species endowed with so quick a principle of life as to rise, flower, and fruit, within the space of three months, or some agamous and cryptogamous species, which adapt themselves to all degrees of temperature, and are consequently the last organic forms under which vegetable life is to be described. Heat and moisture united, the farmer well knows, are highly favourable to the growth of plants. No countries are more abundant in herbaceous vegetables, or better wooded, than Senegal, Guinea, and Cayenne, where both these props to vegetation are in the plenitude of their force. Experiments made with the hygrometer prove that the moisture of the atmosphere increases as we approach the equator*. In hot climates, when the sun sinks below the horizon, the watery exhalations condensed are returned to the earth in the form of a copious dew, that moistens the surface of the foliage, and feeds those vegetables in which the absorbing power of the parts above ground suffice for their support ; of this number are the succulent plants, the *aloes*, the *cacti*, &c.—in these the fibrous root only serves to hold them in their places, and the moisture of the atmosphere is inhaled and retained by the spongy parts above. Thus, in the vast plains that receive the waters from the eastern declivity of the Andes, when the scorching heat of summer has consumed the grasses and other herbaceous plants, which the rainy season has brought forth, we still find some lingering *cacti* which, under their dry thorny coats, conceal a cellular system, by which an abundant sap

* The annual average depth of rain in England is about two feet. In 1840, for instance, the depth at Aberdeen was 24.677 inches ; at Empingham, 18.58 ; Epping, 20.767 ; Falmouth, 31.511 ; Gosport, 25.525 ; Greenwich, 18.24 ; York, 24.72 inches. That is perhaps not much below the average of the continent of Europe. Some portions of western Europe, however, are exceedingly wet ; 123 inches have been noted to fall at Coimbra in Portugal in a year. The fall of rain is still greater in the West Indies. At St. Domingo, 220 inches ; at Cayenne, 116 inches ; at Maranh, 277 inches.

has been imbibed and preserved. But in countries where the atmosphere holds but little moisture in solution, either because the soil is wholly destitute of water, or by reason of the coldness of the temperature, we find no plants at all, or such only as are of a dry hard texture. The sands of Africa, unwatered by rivers, are found to be utterly barren—Spitzbergen, Nova Zembla, &c., where the influence of the sun is felt only for two months of the year at most, and where, consequently, the air is habitually dry, furnish a very scanty portion of herbaceous plants only, or some dwarf shrubs, with a narrow heathery foliage.

Vegetation, in ascending above the level of the sea, undergoes modifications analogous to those which attend its progress from the line to either pole, with this distinction, that in the last case the phenomena succeed by almost imperceptible gradations, while they crowd upon and follow each other in rapid succession on the ascent of mountains. The height of 4,000 or 5,000 yards in the hottest parts of the globe produces changes as distinct as the 2,000 leagues or more which lie between the equator and the polar regions. The three causes of these rapid changes all re-appear within this space, viz., a diminution of heat, dryness of the air, and protracted duration of light. The higher we ascend, the shallower the upper stratum of air becomes—thence the excessive cold at great heights. The weight of the atmosphere which, at the level of the sea, supports a column of mercury equal to twenty-eight inches, diminishes as we ascend, so that, at considerable elevations, it will only support a column of a considerable less height—a power which gradually diminishes as we ascend. A consequence of this fact is, that the vaporization of fluids takes place on high mountains at a very low degree of heat. Notwithstanding this, however, the decrease of temperature is so great that, the ambient air is very slightly impregnated with moisture. It is true that heights have not the long days of the polar regions; but they receive the rays of the sun earlier than the plains, and are quitted later by them, so that their nights are shorter than on levels.

This progressive varying course of vegetation on mountains had not escaped the attention of Tournefort. At the foot of Mount Ararat he had observed the plants which grow in Armenia, a little higher, those of Italy and France, above, those of Sweden, and upon the summits, those of Lapland. Observations of the same kind have been subsequently made on Mount Caucasus, the Alps, Pyrenees, and other mountains of the old continent, and in Britain, whose hills, however, can rarely be dignified with the name of mountains. Linnæus, in his own way, had summed up these observations in an axiom. “The different

kinds of plants," he said, "shew, by their stations, the perpendicular height of the earth." Yet it was not till lately that any exact survey had been taken of this interesting department of botanical geography.

The common heath, (*Erica vulgaris*), says M. De Candolle, which covers the sandy plains that lie along the coast of western France, grows in the Pyrenees to the very summit of Mount Cenis, and to the very summit of Mount Calm, at nearly 3,000 yards of elevation. The cross-leaved heath (*Erica tetralix*) is another instance; it grows from the level of the sea to 2,400 yards of elevation. The sea-gillyflower (*Statice armeria*) is found in Holland in spots which lie below the level of the sea, and on the Alps at an elevation of 2,500 yards. *Statice planaginosa* grows on the beach of Olonne, and at 2,000 yards of elevation on Mount Viso. The coltsfoot and the birdsfoot trefoil both grow at the level of the sea all over England and France, and are met with again above Mount Jovet at the height of about 2,400 yards. The scurvy-grass, which is generally found at the skirts of the sea, flourishes, also at the edge of the stream at Neuville in the Pyrenees, at the height of about 2,000 yards. Mother-of-thyme, (*Thymus serpyllum*), which grows in every lowland spot in France, mounts also to the tops of a great many of the Alpine heights. Even thyme (*Thymus vulgaris*) ascends the Pic d'Ereslids to above 2,000 yards. Foxglove, which is met with in all the lowlands of the west and midland part of France, grows on the Lozere at 1,500 yards, and nearly at the same elevation on Mount Calm.

Mat-grass (*Nardus stricta*) grows at the level of the sea, and it also forms the highest situated swards that are found in the Cevennes, the Alps, and the Pyrenees. It grows indifferently in marshy places and in those which are liable to dry up, so that it is found both on the tops of mountains where the snow disappears in the summer, and on the sides of those from whence it is never entirely absent. The sweet-scented vernal grass (*Anthoxanthum odoratum*) and the Timothy grass, (*Phleum pratense*), which grow everywhere in England and France at the level of the sea, ascend to the elevation of 2,000 yards. The common juniper, (*J. communis*) attains an elevation of 3,000 yards. The marsh lousewort does the same; the scorpion grass 3,500 yards; and the daisy, (*Bellis perennis*), the ox-eye daisy, (*Chrysanthemum leucanthemum*), and the bladder campion, (*Silene inflata*), ascend to 2,000 yards, and the kidney vetch (*Anthyllis vulgaris*) to 3,000 yards. When plants, in fact, not suited by their nature to support an excess of either heat or cold, are found to grow in different latitudes, it is always at such heights as that the effect of elevation compensates that of the latitude. Thus many of the plants of the Alps and the Pyrenees grow in the

plains of the north of France, especially in the Ardennes and neighbouring provinces. Of these I have already cited some instances. Again we know that many plants which belong to Lapland, or other countries of the north of Europe, when they are met with in France, grow there at considerable elevations. *Saxifraga Greenlandica* grows in the Pyrenees very near to the summit of the Maladette, which is 3,278 yards high, and comes down to below 2,400 yards. *Linnæa borealis* is not found in the Alps below an elevation of 1,800 or 2,000 yards. *Menziesia dabaecia*, which covers the low lands in Ireland is found in Western Pyrenees as high up as 1,000 yards. The chestnut grows in the low lands of the north of France, upon the hills of the south of France, and at a great elevation on the Appenines, and at a still greater on Mount Etna.

Plants which are the objects of husbandry are controlled by laws corresponding completely with the preceding. Such as grow in all latitudes, grow likewise at all elevations. Those that are found only in determinate latitudes, are found only in corresponding elevations. Thus we learn from Humboldt, that the potato, which succeeds so well in the north of our old continent, is cultivated in Chili as high as 3,600 yards. We know that the cabbage thrives down at the edge of the sea as well as on the Alps, at every elevation at which man can take up his abode. Corn is also cultivated at very extraordinary elevations. Rye is grown in France, in the departments of the Higher and Lower Alps, at 2,200 yards, particularly above Allos, in Provence. Wheat does not grow so far to the north as rye, neither will it do so well as that grown at great elevations—yet it is grown at 1,800 yards. At such elevations, sowing is generally done before harvest time, that the plants may get strength before the snow falls, which has been known to lie upon the rye the year through. When this has happened, the rye remained *in statu quo* while the snow laid, and resumed its growth at the end of eighteen months, when that had melted away. Barley will grow well only in temperate climates. It is true it may be raised under the tropics, but not at a lower elevation than from 3,000 to 4,000 feet, and then it is a profitless crop.

Cultivated plants, which do not bear cold, are under a like influence as to elevation. They can only be grown at such heights as correspond in temperature with that of the distance from the equator to which they belong. In general, it is considered that in our temperate climate a degree of latitude affects the mean temperature nearly in the proportion of 180 or 200 yards of elevation. This rule, it is true, is liable to numberless modifications from local circumstances; yet I have had the curiosity to apply it (observes M. De Candolle) to the

different plants of husbandry, and have obtained some results that may be worth recording. The most elevated point at which I found maize was grown as a crop is in the department of the Lower Pyrenees above the village of Lescans, at about the elevation of 1,000 yards. Now, if we take our departure from that point, which is the 43rd degree of latitude, and proceed five degrees upon the same meridian line, we come to the neighbourhood of Mans, and to the south of the departments of Ille and Vilaine, which are precisely the northernmost points where maize is used for a crop.

The vines of Velai are perhaps the highest vineyards. The elevation of the town of Puy is computed at 632 yards, and the vineyards that belong to it go up to about 800. Now, if setting out from that point, which is a little beyond 45 degrees of latitude, you take four degrees to the north upon the same meridian, you come to between Rheims and Epernai—that is to say, very close upon the northernmost limit at which the vine forms a branch of husbandry. With regard to the olive tree, the local peculiarities of the countries where it grows are such as to make investigations of this kind very intricate. It is generally cultivated in parts protected on the north by some vast range of mountains, where the mean temperature is consequently higher than it would otherwise be. When it is not sheltered by any range of mountains, the northernmost point in Europe at which we find the olive is Ancona, in 43° 37' of latitude. In respect to the other point of view, its positions have been measured in several parts of Roussillon, Languedoc, Provence, and Italy, and these have been always nearly at an elevation of 400 yards above the level of the sea, which ought to indicate that the olive might grow two degrees more to the north of Ancona. Now, if we take two degrees towards the north from that point on the same meridian, we come to about Lake d'Itarde, and the neighbourhood of Como, which are just the northernmost points at which the olive is cultivated. The fig-tree, which goes farther to the north than the olive, and not so far as the vine, preserves a corresponding gradation in regard to the elevations at which it will grow; but we can hardly determine any precise limit for a tree over which aspect has more power than the degree of positive heat. The same may be observed in regard to the walnut tree, which reaches a little higher both in latitude and elevation above the sea than the vine.

The common oak (*Quercus robur*) grows in the plains on a level with the sea, reaches the slopes of the mountains, and ascends to the height of 1,600 yards. It degenerates in proportion as it approaches the point where it ceases to vegetate. The beech (*Fagus sylvatica*) makes its first appearance at the height of 600 yards above the sea, and its last at 200 yards above the oak. The silver fir (*Pinus picea*) and

the yew (*Taxus communis*) shew themselves at 1,400 yards, and extend to about 2,000. The Scots fir (*Pinus silvestris*) and the *Pinus pumilio* take their stations between 2,000 and 2,400 yards. There the trees stop, and shrubs with a juiceless foliage, and low or creeping stems, present themselves : these lie hid beneath the snow in winter. Amongst them are some of the *Rhododendrums*, *Daphnes*, *Salix*, herbage, and *Reticulata*, &c. Soon after we meet only small herbs with perennial roots—a foliage disposed in a rosette and a naked stalk. These, with the lichens and *Byssi*, arrive at the height of 3,000 and even 3,400 yards. The first that occur are the *Gentiana campestris*, *Saxifraga*, &c. ; then *Ranunculus alpestris*, *Aretia alpina*, &c. ; and, finally, *Ranunculus glacialis*, *Saxifraga cespitosa*, *oppositifolia*, *Androsacea*, and *Greenlandica*. The last brings us to the borders of eternal snow. These are European observations ; but Humboldt and Bomplaud have demonstrated a similar succession of plants in the New World, and in one of the hottest and most fertile regions of our globe.

In the equinoctial countries of America, vegetation displays itself to the view of the observer as on the gradually rising steps of an immense amphitheatre, the base of which sinks below the waters of the ocean, whilst its summit reaches to the foot of the glaciers which crown the Andes, 5,000 yards above the level of the sea—shewing that in America there are vegetables which grow at the height of 1,600 or 1,800 yards beyond the point where vegetation ceases in the Pyrenees and Alps, a difference that does not depend solely upon latitude, but also, according to Mr. Ramond, upon the breadth of the chain of mountains. In chains but of little breadth, such as those of Europe, the air and temperature of the plains have an influence which is constantly tending to confound the limits of the different kinds of vegetables ; but this is not the case in the chain of the Andes, which is from forty-eight to sixty leagues in breadth. (*Journ. Science*, vol. iv., p. 176.—*Brit. Farm. Mag.*) The plants which belong to dark and humid abodes, such as *Boletus ceratophorus*, *Byssus speciosa*, &c., are found on the vaults of caverns and the wood-work of mines, as well in Mexico as in Germany, England, and Italy, concealed within the bowels of the earth ; these less perfect species constitute the last zone of vegetation. Next come the plants which belong to fresh water and to salt water ; of these a great portion grow, without preference, in every degree of latitude, the medium in which they exist preserving a more equable temperature than the atmosphere. Dockweed (*Lemna minor*) and the greater reed-mace, or cat's-tail, (*Typha catifolia*,) grow in the marshes both of Asia, Europe and America—the latter being common to Jamaica, China, and Bengal. Probably there is no region on the globe where the grey bog-moss, (*Sphagnum palustre*) is not to be found. This indifference to climate is

still more remarkable in the sea-plants, such as the *Fuci lavers* and *Ceramia*; the gulf-weed (*Fucus natans*), detaching itself from the rocks on which it grew, and forming shoals of an immense extent on the surface of the water, obstructs the ship's way as well towards the poles as under the line. On a level with the sea, and to a height of 1,000 yards, we find the palms, the liliaceous plants, the plantain trees, and the balsam of solu, with crowds of other species which grow only in a very hot temperature. This is the zone of the palms—a tribe conspicuous for the elegance and grandeur of part of its species, and forming one of the chief ornaments of the scorching plains that lie between the tropics; some of them, however, thrive in more temperate regions. The *Ceroxylon andicola*, a fine palm rising sixty yards in height, grows in the Andes, at Tolima and Quindiu, in the 4° 25' of northern latitude, setting off at 1,860 yards above the sea, and continuing to the height of 2,870, an elevation where the atmosphere is at a moderate degree of warmth. Another species has been discovered at the Straits of Magellan towards the 53rd degree of southern latitude. Two sorts—the fan-palm and date-tree—are even seen to grow on the southern shores of Europe, upon the coasts of the Mediterranean, and not far from the foot of the Pyrenees, thus advancing their tribe to beneath the 43rd degree of northern latitude; but these are exceptions, the palms in general confining themselves to the hottest parts of the globe, and none being met with towards the polar regions.

Some of the effects produced on different soils and in various climates by a difference in the annual amount of rain, have been sketched by Mr. John Morton, in his excellent work on soils, a volume which I have often had occasion to recommend to the careful perusal of the farmers of our islands. When treating of the effects of varying degrees of moisture on vegetation, he alludes (p. 214) to a calculation of M. Humboldt, who states the proportional quantity of rain in different latitudes to be—

Latitude.	Mean annual depth of rain.
0	96 in.
19	80
45	29
60	17

But local causes, as continues Mr. Morton, have the effect of greatly altering their quality. Thus, much more rain falls on mountains, and in their immediate neighbourhood, than on low level land; and again, the proportion is larger on the sea coast than on inland plains; so that it may be taken as a pretty general axiom by the farmer, that the humidity of the atmosphere decreases according to its distance from the sea. At Keswick and Kendal, in Cumberland, the annual quantity of rain is about 60 to 67 inches per annum, while at places in the interior the

average is only about twenty-four inches, and on the borders of Essex and Hertfordshire only about nineteen inches. The greatest proportion of rain in England generally falls in September, October, and November. But even climate is very materially altered by the improvements effected by the skilful agriculturist, such as by the drainage of lakes, bogs, and morasses, the clearing away of forests, the more perfect drainage of cultivated soils, and the conversion of pasture into arable land. In those localities where such improvements have been extensively effected, the evaporation from the surface of the earth is very considerably diminished, and in consequence, the surrounding atmosphere is drier and warmer. This has been partially exemplified in some parts of Scotland, and in the fens of Lincolnshire, since they have been drained.

It is not only, however, the mean average depth of rain which falls upon a district, but the nature of the soil, and especially of the subsoil which hastens or retards the arrival at maturity of its crops—for instance, the harvest is much earlier on siliceous, sandy, or gravelly soil, and considerably later on aluminous or clay soils, than we might be reasonably led to expect from the climate, and their elevation above the level of the sea—thus the crops are never so good or so early on cold tenaceous clay soils on the gritstone formation, or on the moorlands in Yorkshire, at an elevation of 500 feet, as they are on the chalk wolds in the same county, at an elevation of 800 feet. It is this difference which gives to dry calcareous and siliceous soils so very considerable an advantage. Land situated at still greater elevations than this, is in this country of still less value, and at an elevation of 1,000 feet above the level of the ocean it ceases to be profitable for arable purposes, since it is only in very particular seasons that the crops ripen, and hence at such an altitude the land is generally devoted to pasturage.

The effects, then, which I have thus rapidly traced of varying moisture and of heat upon the indigenous plants of the earth, and upon the cultivated crops of agriculture, are circumstances which must be carefully regarded by the farmer who is desirous of varying the ordinary modes of cultivation. They are facts, however, like all those where the influence of the seasons is concerned, which must be ever subjected to very material variations; but still they are sufficiently uniform in their general results to enable the cultivator to draw highly important conclusions, which will not only tend to improve his knowledge of the most scientific modes of productive farming, but enable him to continue his healthful and gratifying researches with all that noble confidence which a better understanding of the works of God, as so beautifully displayed in the laws which regulate the vegetable world, is certain to increase.

ELECTRICITY OF PLANTS, AND INFLUENCE OF ELECTRICITY ON VEGETATION.

Royal Institution.

Friday, May 16.—The Rev. E. Sidney on the Electricity of Plants, and influence of Electricity on vegetation. In introducing the subject of his lecture, Mr. Sidney took occasion to draw attention to the important nature of the inquiry, its high interest as a branch of natural science, and the valuable practical results which might possibly be brought to light in its investigation. The attention of electricians, he stated, had been drawn to the subject so long back as 1746, when a Mr. Maimbray, at Edinburgh, announced that electrified plants grew more rapidly and vigorously than those that were not so treated; about the same time the Abbé Nollet discovered that electrified seeds germinated with increased facility; and these observations were confirmed and extended by the experiments of Bertholon and Jalabert, the former of whom attributed very marked effects to the use of electrified water. The truth of these experiments was supported by some electricians, but denied by others, who, upon repeating them could not perceive any effect produced on the electrified plants; amongst the latter class stands the name of Sennebier; but on reading the account of how his experiments were performed, it is no longer surprising that he failed to perceive any effect from electricity as he placed the seeds which were to be electrified inside an electrified vessel, a situation in which it is evident they would not be exposed to the electric influence. After briefly adverting to the more recent observations of Davy, Pouillet, and others, Mr. Sidney drew attention to the recent progress of the subject, and the high interest it was at present exciting. The first point which the lecturer insisted on, was, that electricity appears to exercise a powerful influence on growing plants; in support of which he quoted a number of experiments and observations, all tending to show that plants, under the influence of electricity, grow with increased vigour, and more especially when negatively electrified. The manner in which drooping plants have been observed to revive, on the artificial application of electricity, was also noticed; and, lastly, the effects which are found to be produced by thunder-storms, were described. The rapid growth of plants during thunder-storms might, no doubt, in part be attributed to other causes; but, at the same time, it was a very fair inference that the electric condition of the air had something to do with the phenomena, as such a conclusion was borne out by numerous experiments, on a small scale, made with artificial electricity. Electricity of low, like that of high tension, has been found to affect germinating seeds and growing plants in a remarkable manner; it was noticed by Davy, that seeds germinated more freely at the negative pole of the voltaic battery than at the positive, and since his time numerous experiments have been made, all tending to prove that voltaic electricity powerfully affects plants. Mr. Sidney next drew attention to the facility with which fresh vegetable matters conduct electricity, in consequence of the good conducting power of the fluids which they contain; this was illustrated by placing a small blade of grass in contact with the conductor of a powerful electrical machine, when it was proved, that the whole of the electricity generated by the machine was quietly carried away by the blade of grass. It was also shown that the pointed forms of the leaves and other parts of plants, com-

lined with their good conducting power, fitted them most admirably to receive or disperse electricity; and hence electricians sometimes employed vegetable points in place of metallic ones for those purposes. To show this, a large Leyden jar was quickly and silently discharged by bringing the pointed blades of grass near its outer surface, and the brass knob at the top. In consequence of the high electric powers of plants, as might be supposed, they exerted a marked effect on the electric condition of the atmosphere, so that when an electroscope indicated abundance of electricity in the free open air, it indicated none in the vicinity of a tree with pointed leaves. In illustration of the good conducting power of vegetable matter, Mr. Sidney stated that it was impossible to give an electric shock to a circle of people standing on a lawn, as the electricity invariably took the shorter and better conducting course through the grass; whilst there was no difficulty in giving a shock to any number of persons standing in a circle on gravel. 3rdly. The apparent adaptation of the various parts of plants to different electrical uses, was pointed out. Thus, the first leaves of many plants are pointed and acute; others rounded or globose. The buds of most plants are pointed, or covered with a strong pubescence. Some plants, more especially those which grow rapidly, have an immense number of sharp points, or pointed hairs; whilst those which grow less rapidly, or are intended to meet the variations of the seasons, are less pointed, but often provided with dry thorns or prickles. As plants come into flower, they generally tend more to a globose form; the flower-buds are generally rounded, and the fruit, or seed-vessels, are seldom provided with acute points. It may, therefore, possibly be the case, that though electricity is favourable to plants at one stage of their growth, it is hurtful to them at others, just as is well-known to be the case with light, which is essential to them when full-grown, but is hurtful to them in the embryo state. The general phenomena of vegetation were then considered in relation to electrical agency.

It would prove an interesting subject of inquiry, to examine in how far the rise of the sap in spring is influenced by electricity; it is certain that in spring, and before the leaf-buds are opened, whilst they still retain their pointed form, the air is dry, and in the most fitting state for electrical effects. Mr. Sidney, then adverted to the singular powers which plants have of precipitating moisture from the atmosphere, an effect which he suggested might possibly be of electric origin, and endeavoured to strengthen this view by a number of ingenious arguments; amongst others, the remarkable cases described by Mr. Weekes and other electricians, in which showers of rain were brought down by the use of uninsulated kites. The lecturer next endeavoured to show that the forms and geographical distribution of certain species of plants indicate a relation to their electrical properties. Thus, for example, the numerous Pine and Fir trees which abound in high latitudes, present most admirable extensive discharging apparatus for receiving or dissipating electricity; and, supposing the preceding observations correct, such trees would exert most important and beneficial influence in equalising the electric condition of the atmosphere, and tending to produce a greater uniformity of temperature. Lastly, the subject was considered as a purely practical one, and the prospect which there exists of electricity being advantageously applied to stimulate and assist vegetation inquired into. Mr. Sidney seemed to think it very questionable whether electricity could ever be usefully applied to

the improvement of agriculture, but, in horticulture (in forcing flowers and fruits,) he thought there were prospects of decided benefit; and, therefore, that this branch of the subject was well deserving a careful experimental investigation.

Electricity, both common and voltaic, might probably be advantageously employed in assisting the germination of old and dry seeds; and likewise, applied with caution, in the culture of exotics and other hot-house plants, its use might be productive of good results. The lecturer exhibited several plants which he had caused to grow in earth under the influence of a feeble current of voltaic electricity, generated by a plate of zinc and another of copper, connected together, buried in the soil beside the roots of the plants; and in the case of plants of Potato, Cineraria, and Mustard, which he exhibited, a very marked effect appeared to have been produced, as the galvanised plants were larger and much more vigorous than those without the plates. He stated that he had also produced a very good effect on Pines, Cress, and Fuschias, but had found plants of Pelargoniums killed by the application of the zinc and copper plates. The well-known experiment of Dr. Forster, on Barley, was then described, and shown to be a decidedly unphilosophical arrangement, so that it appeared very doubtful whether electricity had anything to do with the large increase of crop said to have been obtained by that gentleman. At the same time, the experiment was highly deserving of attention; and Mr. Sidney suggested that it would be well worth while to try experiments on electro cultivation, describing several which have been commenced in Norfolk and elsewhere, on more accurate principles; he also gave a brief sketch of some of the experiments on this subject, at present being made by Mr. Edward Solly, in the gardens of the Horticultural Society. The lecture was, throughout, worded in the most guarded and cautious language, the whole subject being new, and but very little understood; it was, therefore, brought forward rather with a view to excite attention, and induce further research, than to propound theories, or make startling assertions. Mr. Sidney very justly observed, that putting all theories aside, there appeared to be sufficiently numerous well-authenticated facts to warrant further inquiry and experiment.—*From the Gardeners' Chronicle, May 24, 1845.*

ELECTRIC AGENCY APPLIED TO HORTICULTURE.

I have been making several experiments, the results of which have been of the most satisfactory character. My application of the subtle agent has been through the medium of galvanism, and as it is generated it is totally under control, which is not the case if it is collected (as is generally the case) from the atmosphere, which is always subject to the uncertain fluctuations known to exist in telluric and atmospheric electricity. My experiments are, of course, far from matured, but yet they may not be void of interest to yourself.—*First Experiment*: I took an old 50-pair galvanic trough, and lined one-half the length of one side with zinc, and the opposite side in a similar manner with copper; they being about 12 inches long and 2 deep, leaving a distance between the plates of 4 inches, and connected by a zinc band. The trough was filled with moist soil and Turnip-seed sown thickly upon the surface and pressed into it, but not covered, one-half being under the galvanic in-

fluence, the other in a natural state. Results: The seeds under galvanic influence swelled and sprouted many hours before the others, and twice as many vegetated; and by the time they were all well up the galvanic ones had the advantage of 24 hours. I should tell you that they were placed in a temperature of more than 60°, and were all well up in three days; therefore 24 hours is a most extraordinary advance.

Second Experiment: I lined a common flower-pot, 6 inches wide at the top and 4 at the bottom, with zinc and copper, as in the last experiment, the plates being, of course, deeper; I then sowed three Cucumber-seeds in it, and three in another pot, without galvanism, and placed both in the same temperature, as the last experiment. Results: In the course of two days, the galvanic seeds appeared 11 hours before the others; in three days both were well up, the galvanised having greatly the advantage in strength and colour, and going a-head rapidly. After a lapse of a fortnight, the galvanised seeds seemed to have the advantage of four days' growth, were much darker in colour, and about twice as strong, healthy, and vigorous. I also tried an experiment with some Peas, which had been sown some time previously, and were just cutting the ground. A zinc plate, 1 foot square, was placed at the end of one of the double rows, and buried to an inch below its upper edge, and a similar plate of copper was buried at the other end to the same depth, and connected by a copper wire. The weather was showery, and the growth of all was rapid. In the course of 30 hours, the galvanised ones had assumed a darker appearance, and were more regularly up, than the others, and decidedly in advance; and in the course of a fortnight they were so much forwarder than the others, as to be easily seen at a considerable distance, and were altogether much higher and stronger. I am also trying an experiment with some Potatoes, but they are not up yet. These results have been so satisfactory to me, that I intend to try the principle upon an acre of Barley, and am preparing the wires for that purpose; and, when finished, will send you the results.—*A. Ibid.*

INDIA-RUBBER FOR GRAFTING.

It is often, in grafting upon slender stocks and branches, very inconvenient to attach and support a great lump of clay, which, in spite of the greatest care and attention, will, either in very wet or very dry weather, crack and fall away. Last spring I made trial of sheet India-rubber, cut into narrow strips or bandages, from $\frac{1}{4}$ to $\frac{3}{4}$ of an inch broad, which I applied to the graft—having first fixed the graft with bast—and with success. The India-rubber presents all the requisites sought for in clay; it is air-tight and water-tight, and moreover, it will not fall away; and it is elastic, which admits of the swelling of the scion in its growth, and it is applied with perfect ease and quickness. After wrapping the bandage round the graft and stock, as you would a linen bandage on a cut finger, the last turn only requires securing by tying with a bit of thread or thin bass; and it has a very light and neat appearance, when the operation is completed.—*G. L. Ibid.*

Correspondence and Selections.

FURTHER PARTICULARS REGARDING THE NERIUM INDIGO.

Extract of a letter from G. J. FISCHER, Esq., dated Salem, 8th January 1845, to Dr. ROBERT WIGHT, at Coimbatore.

I have just received your packet of the 4th, and shall be most happy to contribute what information I can in removing Mr. Taylor's sceptical impressions in regard to the "Nerium Tinctorium."* The Statement in the "Library of Entertaining Knowledge," is perfectly correct, every part of it. It is to the hilly and woody Carnatic and Northern Circars he must look for a confirmation of it, and not in the open champaign country of Bengal.

The "Nerium Tinctorium," commonly known as "the Palah tree," grows wild, and in the greatest abundance, in all the hilly tracts throughout Southern India; and the natives have made Indigo from it for country consumption from time immemorial. Their process is a very rude one, and consequently their produce of a quality not at all suitable for export, full of sand and dirt of every kind; yet there is the dye; and though of impaired strength from bad treatment, yet it answers all their purposes from being so cheap and so soluble,—it is generally used in the state of paste. Dr. Roxburgh's treatise on the subject (the Indigo was no discovery of his, but only an improved mode of manufacture that he adopted,) induced Mr. Heath to turn his attention to it in 1823, and to set up factories after the Doctor's plan, with the exception of the beating apparatus which was greatly improved by one of his superintendents, and with the exception that we bought the leaves by weight, instead of employing coolies on monthly pay to bring it. These factories Mr. Heath worked till 1830, when he gave them up, partly from failure of funds, partly on account of the

* Mr. Taylor's remarks will be found at page 86.—*Eds.*

great fall of Indigo, and partly in favor of certain Chrome* works which he was setting up at Porto Novo, and for which the boilers were required, and taken away. In the beginning of 1833, I took over the factories, dismantled as they were, in settlement of accounts between us; and in 1834 the famine having broken out, and the Indigo trade revived, I applied to Government, and got some boilers from their Gunpowder Manufactory, the only place where they were obtainable, and set two of the factories agoing. I could not afford to do more, because the price charged by Government was so enormous, 50 per cent., in addition to what they themselves had paid for them, which was high enough: and these two factories I have worked ever since with tolerable remuneration. The Indigo sells better than even the Cuddapah indigo. In 1842, it fetched from 4*s.* to 5*s.* 6*d.* per lb. Later Account Sales I have not got.

The only reasons I can assign for the non-extension of works for this kind of Indigo are the great expense of the boilers, and the limited quantity of Indigo that you can make at any one place. I meet the last drawback by making both kinds of Indigo at the same works, the *Nerium* and the *Avery*: they interfere very little with each other, and the same works and same establishment answer for both; and, by the two together giving the works constant employment during the season, reduce prices materially.

It will never do to sow the tree; it is of exceeding slow growth†, and hundreds of thousands are required to feed one work, nor will a work succeed except where natural advantages are combined, such as plenty of jungle for firewood, and plenty of land, paying no rent to

* This was in consequence of the high prices of the Chrome dye at the time, and the discovery of a rich deposit of the Chromate of Iron in this neighbourhood.

† "How far Mr. Fischer is correct in his remarks regarding the slowness of the growth of the tree, I am, at present, unable to say. In the arid sterile soils where only it is permitted to grow wild in any abundance, I dare say he is right; but I suspect if treated like mulberries, and grown in a richer soil, it will not be found so slow. The question will then be, whether the cultivated plant will yield as good Indigo as the wild one? This can only be ascertained by experiment. As it is never cultivated in this part of the country, I am sorry I can give you no information on that point. The tree itself is certainly a very handsome one, and well worth the trouble of introduction simply on that account, even should it disappoint the expectation of speculators."—*Extract of Dr. Wight's letter of 19th June, 1845, to the Secretary of the Agricultural Society.*

China Sugar-cane.

Government, yielding the tree, and that free of cost and charge of planting; but of such situations there are thousands in Southern India, and all that is wanting to turn them to account is capital and enterprise.

SUCCESSFUL CULTIVATION OF THE CHINA SUGAR-CANE AT BUXAR AND DHOLA.

*Extract of a letter from P. P. CARTER, Esq., dated Bhojpour, near
Buxar, 5th June 1845.*

“Of the five descriptions of Sugar-cane I obtained from the Society in March last, the “China” has succeeded so wonderfully in spite of white ants, heat, and every evil, from which the others (and even the country cane of the district) have suffered so severely, that I am very anxious to have some correct information of its qualities; and shall feel very much obliged to you for obtaining the opinion of any person who may have given it an extensive trial in this country. Should this “China” prove to be a good yielding-cane, producing sugar of good quality, I would cultivate it in preference to Otaheite and every other description I know of. I am rather curious to know what height and thickness it attains at full growth, as from its present vigorous appearance it promises even to surpass the Otaheite, while the seeds were scarcely thicker than my little finger. In March last I found a species of sugar-cane growing on the “Deearrah” or alluvial lands of the Ganges so much larger than the common (the specimens brought me being at the least eight cubits long and two quarters of an inch in circumference,) that I got some and planted out in the same field with some of the country, and from its vigorous appearance and broad, dark-colored leaves and hardness, it very closely resembles the “China” above spoken of. The natives pronounce it an inferior cane, the goor obtained from it being not easily convertible into sugar; but this, I am inclined to believe, is rather attributable to the soil and mode of cultivation, and to its generally being for upwards of two months in the rainy season, inundated by the Ganges.”

MY DEAR SIR,—In reply to yours of 16th instant, I regret I am unable to furnish your correspondent at Buxar with any satisfac-

tory account of the actual yield in sugar from the China cane, my cultivation of it hitherto having been on too small a scale to allow of my working it up separately with our machinery. It may be however some satisfaction for him to learn, that so far as the experiments I made with it extended, they proved quite as promising here as he has found his to be in Buxar, and it was only your inability to supply me with plants that prevented my extending the cultivation this season. Of all the varieties of cane I have tried, the China has proved by far the hardiest in surmounting the attacks of white ants, heat, and drought, and it has yielded me a good crop at the rate of two hundred and two B. Mds. of cleaned cane per beegah from the same situation in which Otaheite, and two varieties of blue cane, were all but destroyed by the white ants; and in which common country cane yielded its usual average of 150 Mds. per beegah.

At the mill the China yielded fifty-five per cent. by weight of juice to forty-five per cent. trash, the juice being of the gravity indicated by eleven per cent. of Baumé's Saccharometer, which is equal to the average of the best cane juice I have seen produced in these parts: so that there is nothing in these premises to discourage the hope of its produce in sugar proving inferior to the results it gives in the field.

Its aspect when growing also seems to confirm its adaptability to this climate, for though the canes are only from three-quarters of an inch to one inch in diameter, it grows to the height of ten and twelve feet with very ordinary cultivation, and I have counted as many as eighteen and twenty canes spring up from one stole. It has a bountiful supply of long slender leaves, which keep their fresh green appearance far better than the other varieties.

I had an October cross last year, half with China and half with country cane plants: the latter barely survived through January, and were all cut off by the hot winds before March was over; while the China are now fine-looking plants, and I hope will be ready to cut by November next.

I hope the above may be not quite without interest to your correspondent, and I should be very glad to learn in due time the result of his own experiments.

I remain, &c.,

Dhoba, 20th June, 1845.

S. H. ROBINSON.

ACCOUNT OF AN EXHIBITION OF VEGETABLES, FRUITS, &C. HELD AT
LUCKNOW IN JUNE, 1845.

*Extract of a letter from Capt. G. E. HOLLINGS, Secretary Branch
Agri-Horticultural Society at Lucknow, dated 18th June, 1845.*

"I have the pleasure to forward a list of the prizes awarded at our Exhibition of the 9th instant; the show far exceeded our anticipations, and there cannot be a doubt that a periodical repetition will ensure the attainment of the object we have in view, namely, an improvement in the culture of fruits, vegetables, and flowers.

"Specimens of cereal grains grown in our garden were exhibited for the satisfaction of those who took an interest in their cultivation. You will be able to form an opinion of their quality when you get the parcels I have forwarded by steamer."

*List of Prizes given to the different Mallees belonging to the Gardens
in the Cantonment and the City at Lucknow, on the 9th June 1845.*

<i>Names of Articles.</i>	<i>Amount of award.</i>	<i>To whom awarded..</i>
<i>Fruits.</i>		
Bombay Mangoes,		Nidhan, Colonel Wilcox's Mallee.
1st Sort,...		Munshaw, Charbaugh ditto.
2d Ditto, ..	1 8 0	Ditto — ditto — ditto [bad do.
3d Ditto, ..	2 0 0	Ellahee Bukhsh, Gardener of Hosseina-
Country, 4th Ditto, ..	1 0 0	
Peaches.		
1st Sort,....	2 0 0	Issuree, Lieut. Chamberlain's do.
2d Ditto, ..	1 0 0	Nanhoo, Charbaugh do.
China Ditto,		
1st Sort,....	2 0 0	Issuree, Lieut. Chamberlain's do.
2d Ditto, ..	1 0 0	Keerah, Residency do.
White Grapes,	2 0 0	Bhola, Captain Bird's do.
Purple Ditto,	2 0 0	Thakoor, Charbaugh do.
Bedānāh'ditto,	2 0 0	Keerah, Residency do.
Strawberries,	3 0 0	Nanhoo, Charbaugh do.
Plantains,		
Large,	1 0 0	Golaub, Mirza Dara Setoat Bahadoor's [do.
Small,	1 0 0	Dhurrum Doss, Residency Mallee. [do.
Musk Melon,	1 0 0	Golaub, Mirza Dara Setoat Bahadoor's
Water Melon,	0 8 0	Ditto — ditto — ditto.
Figs,		
White,	1 0 0	Keerah, Residency Mallee.
Black,	1 0 0	Budloo, Major Scott's do.
Alloobokharah,	1 0 0	Bisram, Captain Bird's do.
Phalsa,	0 4 0	Ellahee Bukhsh, Hosseinaabad do.
Shaddock,...	0 8 0	Ditto — ditto — ditto.
Orange,	0 8 0	Hoolass, Charbaugh do.

Names of Articles.	Amount of award.	To whom awarded.
Cocoanut,	1 0 0	Bisram, Captain Bird's Mallee.
Pomegranate,	1 0 0	Keerah, Residency do.
Guavas,	0 4 0	Goorbuxsh, Rev. Dr. Carshore's do.
Sugar-cane,		
1st Sort,	2 0 0	Keerah, Residency do.
2d Ditto,	1 0 0	Gungah, Captain Bird's do.
<i>Vegetables.</i>		* N. B. The prize Mango weighed forty-four rupees.
Asparagus,	2 0 0	Nanhoo, Charbaugh Mallee.
Cabbages,	1 0 0	Goorbuxsh, Rev. Dr. Carshore's do.
Carrots, English,		
Orange,	1 0 0	Nihaul, Colonel Wilcox's do.
White,	1 0 0	Thakoor, Charbaugh do.
Carrots, Horn,	1 0 0	Goorbuxsh, Rev. Dr. Carshore's do.
Turnips,		
Red,	1 0 0	Ditto — ditto — ditto.
White,	1 0 0	Nihaul, Colonel Wilcox's do.
Potatoes,		
Bangor,	1 0 0	Ditto — ditto — ditto.
Apple,	1 0 0	Dabee, Charbaugh do.
Beet Root,		
Red,	1 0 0	Oussaree, ditto ditto.
White,	1 0 0	Thakoor, ditto ditto.
Salsify,	1 0 0	Oussaree, ditto ditto.
American Parsley, ..	0 8 0	Ditto — ditto — ditto.
Celery,	2 0 0	Goorbuxsh, Rev. Dr. Carshore's do.
Onions,		
Bombay, .. .	1 0 0	Keerah Residency Mallee.
Sereenuggur,	1 0 0	Munshaw, Charbaugh do.
White,	0 8 0	Teizee, Dr. Login's do.
Leek,	0 8 0	Nanhoo, Charbaugh do.
Yams,	0 8 0	Bukhtawur, Captain Fraser's do.
Maize,		
American,	1 0 0	Oussaree, Charbaugh do.
Country,	0 8 0	Gouree, Residency do.
Kurrella, .. .	0 8 0	Keerah, Residency do.
Bangun, .. .		
English,	0 8 0	Sukkut, Lieut. Fenwick's do.
Country,	0 8 0	Teizee, Dr. Login's do.
Tomato,		
Large,	0 8 0	Sukkut, Lieut. Fenwick's do.
Cherry,	0 8 0	Goorbuxsh, Rev. Dr. Carshore's do.
Capsicums,	0 8 0	Nanhoo, Charbaugh do.
Pulwul,	0 8 0	Dyal, Residency do.
Sheetaphul or Cucurbita Pepo,		
Cabool,	0 8 0	Ditto — ditto — ditto.
Country, .. .	0 8 0	Chutree Poor House's do.
Beans,	0 8 0	Bheekharee, Captain Hollings' do.
Turmeric,	0 4 0	Bissram, Captain Bird's do.
Arrow-Root,	1 0 0	Nanhoo, Charbaugh do.
<i>Flowers.</i>		
1st Sort,	3 0 0	Bhola 2nd, Colonel Hervey's Mallee.
2d Ditto, .. .	1 0 0	Bheekaree, Captain Hollings' do.
3d Ditto, .. .	1 0 0	Sobha, Colonel Wilcox's do.
Total, Rupees,	67 4 0	

G. E. HOLLINGS, Secretary.

Experiments on the growth of Indigo, under various modes of treatment. Communicated by W. HAWORTH, Esq.

To JAMES HUME, Esq., Secretary Agricultural Society.

MY DEAR SIR,—I have the pleasure to hand you the following particulars of an interesting experiment I have lately had tried on a small scale, on the growth of *Indigo* under various methods of treatment; the general result of which, I have no doubt, will prove interesting to many members of the Agricultural Society.

On the 22nd March last, six rows, of about eight feet long each, were sown with the same description of Indigo seed, as follows :

Row No. 1.—Was sown in the usual way in poor ground, without manure.	Result, 31st July.—A fair healthy plant, about 4 feet to 4.6 high, well covered with leaves and small branches.
--	---

Do. No. 2.—Seed mixed with a small quantity of pulverized sal-ammoniac, and sown together.	Result, 31st July.—No signs of vegetation had ever been seen from the time the seed was put in.
--	---

Do. No. 3.—The seed was sown in plain ground as in No. 1, and at once placed under the influence of galvanism.	Result, 31st July.—A very healthy plant, of about 5 feet in height; but unfortunately this row was partly shaded from the sun by a tree during the greater part of the day, and evidently suffered from this cause, as did also a part of row No. 1; and on this account I consider this part of the experiment unsatisfactory.
--	---

Do. No. 4.—The seed in this row was sown mixed with bone-dust.	Result, 31st July.—No signs whatever of vegetation.
--	---

Do. No. 5.—The seed was steeped in a weak solution of sulphate of ammonia for 24 hours, and then sown.	Result, 31st July.—A very fine plant from the first, about 6 feet high to 6½, and well covered with leaves and small branches.
--	--

Row No. -6.—The ground in this experiment was prepared by watering it with a solution of 1 oz. of sulphate of ammonia, and two quarts of water, which was sufficient to saturate the ground to a moderate depth.

Result, 31st July.—Was the most satisfactory of all, the plant reached the height of 6 to 6-6, and was most luxuriantly filled out with branches covered with healthy leaves, and in every respect appeared to be all that could be wished.

I have but a few observations to make on these experiments, and my object in now bringing the subject before the Society, is to call the attention of parties more deeply interested than myself in the growth of Indigo, as well as other parties generally interested in Agricultural pursuits, to the importance of further investigating the influence of electricity on vegetation, as well as to the use of various well known and inexpensive salts as manures, and also to test the value of various manures, such as bone-dust, guano, &c. I believe most planters have sufficient time, and can also easily attain the necessary knowledge for carrying into effect such simple trials; a moderate degree of patience and perseverance is required to ensure success. In the above experiments it will be seen that Nos. 2 and 4 were entire failures in this instance; still, I have no doubt, further trials of the same processes, somewhat modified, would be successful: for instance, had the sal-ammoniac in experiment No. 2 been mixed with a quantity of earth some days previous to the seed being sown, or had it been applied to the ground in the form of a solution as in experiment No. 6, it is probable it would have succeeded; again, had the bone-dust in experiment No. 4 been first mixed with earth and allowed to remain for some days to expend a portion of its strength on the surrounding soil, it would have answered better.

I may add, that in consequence of observing the very rapid vegetation of the plant under the influence of "galvanism and ammonia," compared with the plant growing in common earth, I had *three* pots prepared, into each of which four stems of the Indigo plant, from rows Nos. 1, 3 and 6, (say the plant from each number into separate pots) were transplanted. These I intended for the inspection of the members of the Society at their last Meeting; but from various causes I overlooked the appointed day, or else these specimens were very satisfactory.

The plants under the influence of galvanism, were twice the height of those growing in the common way ; but the plants from *seed only*, steeped in a solution of ammonia for 24 hours, were more than three times the height and size of the common plant ; it also came to maturity, and seeded nearly a month before the latter, or plant growing in common ground, and the plants under galvanism kept about midway between the two both as to bulk and time of seeding : they are still in existence, but the backward plant has now nearly overtaken the forward ones, except that the seed of the latter is now almost all ripe, while the rest is in green pod. I am sorry my immediate departure from Calcutta will prevent my continuing these experiments ; but I trust to hear, that other parties have been induced to follow up such trials on a more extended scale than I had either time or convenience to put in practice.

I remain, &c.

W. HAWORTH.

Calcutta, August 4, 1845.

Progress of Silk culture at Bangalore, with a few remarks on the vegetable products of that station. Communicated by Dr. F. J. MOUAT.

To J. HUME, Esq., Honorary Secretary, Agricultural Society.

SIR,—I beg leave to send you a few shawls to show to the Agricultural Society as specimens of Mysore manufacture. The silk was obtained from worms reared in the neighbourhood of Bangalore, where there is a splendid mulberry garden and stone worm-house, containing an immense number of the insect in every stage, from the egg to its perfect and mature condition. Captain Haines, the Superintendent of the Garden, has promised to send me an account of it with specimens of the cocoon and raw silk when reeled. The manufactured condition is well exhibited in the specimens now submitted, of which the dyes, patterns and every thing connected with them are the unaided labours of the Bangalore manufacturers, with the single exception perhaps of the reels, some of which were constructed by Capt. Green of the Madras engineers, and are very

simple and efficient. The shuttles used are all native, and of the rudest and most primitive form. It was my intention when I visited the garden and manufactures carried on within the pettah or native town of Bangalore, to have drawn up a short account of them for the Society; but as the officer in charge of them, who is not only well acquainted with the subject, but takes great interest in it, has kindly promised to do so, the Society will be no losers by my silence. The silk manufactures of every part of India are so important, and capable of being carried to so great a pitch of perfection, as to be worthy the attentive consideration of all, who take an interest in developing and improving its resources. To no one can any part of the country be more deeply indebted than is Mysore to the present Commissioner, General Cubbon of the Madras Army, an officer uniting the highest and rarest mental endowments, with the best qualities of the heart, who has not only succeeded in raising considerably the revenues of the province entrusted to his care, but has accomplished the more difficult task of conciliating the turbulent refractory spirits under his rule, and gaining the good will of every class, native as well as European. My recent visit to Bangalore was so brief, and at so bad a season of the year, as to prevent my investigating its mineral and botanical resources, nor could I obtain any of the great works which have already been published, and afford valuable information regarding the Mysore territories generally.

The Botanical Garden* which was so flourishing under the zealous care of Captain Munro, of H. M. 39th, and Dr. Smith, has been abandoned, and made over I believe to the Rajah, from want of encouragement and support from the residents of Bangalore. Its distance from the cantonment appeared to be the chief objection to it. The natural advantages of Bangalore as regards climate and soil are very great, and might with a little public spirit and enthusiasm in agricultural pursuits, be rendered productive of much benefit to the surrounding country, yet there is probably no station in India of the same size, and possessing a similar amount of wealth and intelligence, where so little use is made of them in these matters.

* A very interesting report regarding this garden, drawn up by Capt. Munro in 1839, is published in Vol. VI, of the *Society's Transactions*.—*Eds.*

The vegetables of the Calcutta market with all our natural disadvantages to contend against, are, thanks to the exertions of the Agricultural Society, superior to those of Bangalore, where they might be easily rendered as fine as are to be found in any quarter of the world, by teaching the native gardener improved methods of cultivating them.

The whole surface of the part of the country through which I passed was covered with masses of granite, and gneiss is stated to be the universal subjacent rock; mica, felspar, and quartz also occur in great abundance.

Flowers are numerous and varied in the private gardens of Bangalore, and many fruits attain great perfection; among the former may be enumerated several varieties of the rose, geranium, dahlia, violet, honeysuckle, sweet briar, jessamine, pinks, stock, larkspur, with several other kinds which appear to thrive without much care or cultivation; among the latter are seen strawberries, melons, grapes, mangoes, apples, oranges, the pumplenose; and some others, which do not thrive so well.

Bangalore in fact needs only the presence of a Major Napleton, to render it a perfect paradise for the production of fruits, flowers, and vegetables.

Calcutta, Medical College,

August 2nd, 1845.

I have, &c.

F. J. MOUAT.

Report on the Silk Fabrics alluded to in Dr. MOUAT's communication.

*(Extract of a letter from J. W. LAIDLAY, Esq., dated Calcutta,
12th August, 1845.)*

“I have taken some pains to ascertain the value of the silk shawls from Bangalore, which are highly interesting from the rapidity with which so beautiful a manufacture has sprung up where a few years ago silk was scarcely known. I am not sure however if much dependence is to be placed in the valuations I have obtained, for such manufactures are quite unknown in this part of India, where the weavers attempt little beyond the plain Korah, unless it be a few checked goods and imitation of tartans at Cossimbazar, and some poor attempts at raised or flower-work at Radanaghore. The former

of these, under due encouragement, might be much improved; I send a specimen of checked work I happen to have by me. These shawls were pronounced by all the dealers to whom they were shown to have come from China; and valued, at 20 for the largest, 8 for the next, and 4 Rs. each for the rest. I do not think them *over-valued* by any means: for the texture seems good, the colours are very fine, and in every respect they are a creditable specimen of Mysore skill. The warp seems to have been prepared somewhat differently from what is customary in Bengal; having been *trammed* or *orgauzined*, whereas in silk goods made here it is used plain. I think the Society is much indebted to Dr. Mouat for the opportunity he has afforded us of seeing these interesting productions."

EXPERIMENTS WITH GUANO ON GARDEN PRODUCE.

Extract of a letter from F. W. RUSSELL, Esq., C. S., dated Hooghly, 2nd August, 1845.

"The following are the results of some of my experiments with the guano which you were so kind as to send me, and they are much at the service of the Society.

I weighed three seers of guano and sprinkled it on a piece of ground, about 30 yards long by about 20 wide, during a shower of rain. A few days after I sowed on part of it two seers of marrow-fat peas, and I planted out some cauliflowers and nole-kole and cabbages. All came on most astonishingly, and the peas looked strong and healthy; but when they reached the height of a foot or so, they ran rapidly up in a few days, then shrunk and died as if over-exhausted. In another spot I planted marrow-fat peas, and when they were about eight inches high, prior to putting the rods to them I drew two lines with a quill on either side of the plants, about eight inches from them, and put a small quantity of guano in the drill and covered it up and watered it. I suspect I dosed them too strongly; they seemed to receive unusual vigor, but died very soon. I then tried a third experiment; I soiled the ground, which was previously rich, with a lesser dose of guano than the first. I put one seer where I had be-

fore used three ; the result was astonishing ; the plants ran up to the height of ten feet and more, with stems thicker than I ever saw or could have believed possible, and I feared it would be " all cry and no wool ;" but they threw out magnificent flowers and then podded, and the length of the pod and size of the peas astonished every one who eat them,—their flavor was delicious. The pea experiments were all on the same seed, marrow-fats from Patna. The nole-kole were finer than any I ever saw. I cannot say much for the cabbages ; some persons thought them very delicious, but I own I did not myself observe much difference ; perhaps they would have stood a stronger dose. The cauliflowers on this ground flourished magnificently. I never beheld finer or more splendid plants ; but when they flowered, they threw up the flower at once like seed, and there was no fine, firm, flat head ; they were like cauliflowers running to seed, but they did not bear any. I tried an experiment on other plants. I put a circle round the root, and put a less quantity than I had done, at least so I thought. They were certainly fine plants, but did not come up like those manured with bone-dust ; but not having any bone-dust this year, I could not compare them together. I had not sufficient leisure to make so strict an investigation as I could have wished, but I am sure that an attentive gardener will benefit his peas and nole-kole with guano ; but he may kill them by an overdose : hence, it must be done with skill and care. I killed a whole bed of fine parsley and onions, with only sprinkling a very little on the ground."

ACCOUNT OF A THREE-YEARS-BEARING MANGO TREE OF ARRACAN.

*Extract of a letter from Major D. WILLIAMS, to DR. WALLICH,
dated Kyook Phyoo, 7th July, 1845.*

" I may as well mention how I became acquainted with this three-years-bearing mango-tree. Some years ago when in charge of the Ramree district, an old and respectable inhabitant of the town brought me some mangoes which, from their shape, smoothness of skin, and superior flavor, were very different from those I got elsewhere ; on enquiry I found the fruit grew in his garden, whither I immediately went, and was astonished to find trees not above four

feet high covered with beautiful-looking ripe fruit, the branches being supported to prevent their breaking under their heavy burden.

I had all trees that would bear it removed to the cutchery grounds, some even with their fruit on, and they are alive and bear to this day ; afterwards, yearly, I purchased from the old man his mangoes, and raised from their seed, plants which I distributed all over the district of Ramree, and am now doing so in this district, and planting them in gardens of my own. They are never raised from grafting, of which the Mugs know nothing. The seed will vegetate by being thrown any where in shade (the sun will destroy it) exposed to the rain or moisture ; our common mango trees fail in bearing occasionally, every third year I believe : these trees have never failed, nor have I seen any of them attacked by worms. The stone or seed is flat, the skin smooth, not much thicker than paper, and the flavor delicious. It is my intention to send some plants for the Horticultural Society to Mr. Hume, and shall feel obliged by your mentioning this to him.”*

RESULT OF AN EXPERIMENT TO INTRODUCE AMERICAN COTTON INTO
THE DISTRICT OF SHAHABAD.

Extract of a letter from GEO. FIELD, Esq., *Deputy Opium Agent, to*
E. C. RAVENSHAW, Esq., *Commissioner of Patna, dated Arrah, 5th*
July 1845.

“ I did not submit the promised report in continuation of my letter of the 18th July 1843,† on the result of the experiment made to introduce the American cotton seeds into this district, as it proved quite a failure as far as the native cultivators were concerned. With my letter above-mentioned, I sent samples of the produce of the few fields that escaped destruction by the heavy rains of 1842, and the gale of October of that year ; and during my tour of the district in the cold season of 1843-44. I went to these villages and made enquiries

* Since this letter was written, Major Williams has kindly forwarded five seedlings, which have been planted out in the Society's Nursery garden.—*Eds.*

† This communication of Mr. Field will be found in Vol. II, page 200, of the Journal.—*Eds.*

about the crop, but found it had been ploughed up and the ground sown with other crops, and that there was no disposition to renew the experiment; in fact, the cultivators thought it a hardship that their best lands should thus be occupied in experiments.

As regards my own attempt, the result was otherwise. The 12½ cottas of ground sown in my garden yielded 36 seers of seed cotton the first year, three maunds the second year, and one maund the third year, without any labour or expense beyond weeding and earthing up; the quality of the cotton is excellent, far superior to the produce from the native seed. The return of the second year is about 600 lbs. per acre, about the average produce of the native seed, but the proportions of seed and cotton are considerably in favor of the American seed. The American yields $\frac{1}{3}$ cotton, $\frac{2}{3}$ seed; the country $\frac{1}{4}$ cotton, to $\frac{3}{4}$ seed in this part of the country."

*Result of trials given to various Seeds in the District of Champaran.
Communicated by J. W. YULE, Esq*

JAMES HUME, Esq. *Secretary to the Agricultural and Horticultural Society,
Calcutta.*

SIR,—Having lately obtained from Government the lease of a large estate in this district, bordering on the Nipalese country, and extending to the lower range of Hills, in which rice is the staple product, I am anxious to introduce a description of grain, superior to what is now in general use; and learning that the Carolina Paddy is much prized, I would feel greatly obliged by your sending me a small quantity on trial, by the first Steamer for the Upper Provinces, addressed to the care of Messrs. A. Charrier and Co. Steam Agents, Dinapore. By the same opportunity I will likewise thank you to forward some 'Sumach,' seed, which is very likely to succeed here.

The soil is rich, and well adapted for almost every sort of grain, and the facilities of irrigation are, owing to the vicinity of the hills, great, and attainable at a trifling cost. I am convinced therefore that were a better description of seed corn introduced, and more care taken of the cultivation (which I am doing all in my power to impress on the

minds of the Ryotts,) it might be made to yield double what it does at present.

Should you then have any fine sorts of Wheat, Oats, Barley, Gram, and White Linseed to spare, I would esteem it a very great favour your sending me a small quantity of each.

The country is moreover quite free from white ants, and is perhaps on that account well suited for the cultivation of Sugar-cane. As I am anxious to give it also a trial, may I trouble you to register my application for 200 canes of each sort in the Society's garden, should any be distributed this year.

Flower and vegetable seeds will also be very acceptable when the season for distribution arrives.

I am, &c.

J. W. YULE,

Member of the Agricultural and Horticultural Society.

Memorandum of Seeds, &c.

Carolina Paddy,	} for immediate use.
Sumach,	
Wheat,	} for October Sowings.
Oats,	
Barley,	
White Linseed,	

200 of each sort of Sugar-cane.

Flower and vegetable Seeds.

*Ramnuggur, vid Betteah, District
of Champaran, May 9, 1845.*

JAMES HUME, Esq. *Secretary to the Agricultural and Horticultural Society,
Calcutta.*

DEAR SIR,—I have delayed to acknowledge the receipt of your letter of 28th May, until I could inform you of the arrival of the box containing seeds, the despatch of which you there advised, and at the same time be able to send you a report of what I have done, and the result.

I now beg to do so, and at the same time to tender you my best thanks for your kind attention, in so promptly meeting my wishes.

On the 21st ultimo the box containing the seeds reached me in safety, and as the ground had been prepared some days previously, I put the following in next day, viz., the Chota Nagpore Paddy and American Maize Seeds.

On the 23rd, I sowed part of the Sumach, Madder, Guinea grass, *Acacia lophanta* and *Nerium tinctorium*.

On the 26th the Paddy came above ground, and on the 11th instant was transplanted from the bed in which it was sown, measuring 24 square yards, to a field measuring 780 square yards; and there it is growing most luxuriantly.

On the 26th the "Flint corn" appeared above the surface, and is growing well, but of the other two sorts sent only a plant of each has vegetated.

On the 27th, the Sumach came up partially, and continued to vegetate daily until the 30th, when in consequence of the heavy rain which fell on that day, I transplanted all that I thought could bear it into small flower pots, and I was fortunate in having done so, for from the 1st to the 7th instant about 17 inches of rain fell, which destroyed all that had been left on the ground. I have now therefore only 19 trees remaining, but as they are thriving well, I hope to form from them a nursery sufficiently large to give the plant a fair trial on this soil.

Of the *Acacia lophanta* I have succeeded in saving three plants, but of the Madder not one seed has come above ground; however I have plenty of it remaining, so shall continue to sow a small portion every month, in the hope of at last hitting on the proper period. Of the *Nerium tinctorium*, on the other hand, scarcely a seed has failed, and as I find from the description of the plant in part 2, of the 4th Vol. of the Journal, just received, that it becomes a large tree, I must transplant them to a greater distance from each other than I had intended.

The Guinea grass is thriving well, also the dahlias, but of the latter I have only saved eleven plants, the rest having been destroyed by the heavy rain.

Of the Tobacco seeds only one sort, the Latakia, has come above ground, the other three never having vegetated at all.

I am sorry to say that the weevil or goon has got into the wheat and gram seeds,* or rather both of these insects have attacked them, and I begin to fear that there will be none left to sow when the season arrives. The white linseed seems in very good condition, however, and will I trust escape.

Some of the Sumach plants are already upwards of six inches high, and I am inclined to conclude from this rapid growth in so short a time, that the soil hereabouts is suited to its culture.

I remain, &c.

J. W. YULE.

Ramnuggur, 30th July, 1845.

Award of Prizes by the Agricultural Society of Madras, for Samples of Raw Silk. Communicated by Captain F. S. GABB, (52nd Madras N. I.) Secretary of the Society.†

Extract from the Proceedings of a special General Meeting of the Madras Agri-Horticultural Society, held at the Society's Garden on Monday the 3rd February 1845, at 5 o'clock P. M. to determine the prize articles sent in for competition.

Samples of the prize articles are laid before the Meeting, also the specimens of silk received from the Agricultural Society at Calcutta, as a criterion to be guided by.

Twenty-two lbs. of Raw Silk, equal quantities of white and yellow, of the Fusculum estate at the Neilgherry Hills, from Major F. Minchin.

The following from N. A. Groves, Esq.

Twenty lbs. of yellow silk reeled at the Neilgherry Hills, the produce of Indian worms of Signor Mutti.

Five lbs. of the same as the above, reeled at Chittore by the School children.

* These are the Taganrog and Egyptian wheats and white gram forwarded by Dr. Royle by the overland mail, and received in May.—*Eds.*

† "I have the pleasure, as requested, to transmit the enclosed extracts from the Proceedings of our Committee, relative to the competition for Silk Prizes in February last."—*Extract of letter from Capt. Gabb, dated 20th August 1845.*

Five lbs. of white, also originally obtained from Signor Mutti, and reeled by the children.

Ten lbs. of silk of the indigenous worm of this country, also reeled by the children.

Twenty-two lbs. of silk of the Mysore worms, and reeled in Madras by Mahomed Cassim.

Eight lbs. of silk the produce of Signor Mutti's "Cross breed," the Italian with the Egyptian worm, reeled by Padsha Saib in Royapettah, Madras.

The Secretary explains that the cause of the small quantity of silk brought by Padsha Saib, was the heavy loss of worms he lately experienced at the time of the late rains, upwards of two lacs having perished. Padsha Saib was the first person who attempted the culture of silk-worms in Madras; after the late Secretary, Major Reid, C. B. had procured from Bombay a better description of worm he made over to Mahomed Cassim the indigenous country worms in his possession, and thus armed him with weapons to turn against himself.

From Monsieur Perrottet of Pondicherry, enquiring if Silk pro-
duced there will be allowed to compete for the
Read the following Letters. prizes.

From the Secretary to the Mysore Commissioner, stating that he had forwarded to Messrs Ashton, Richardson and Co. specimens of Silk cloths, &c. the manufacture of Mysore, and requesting that they may be exhibited at the Society's show, with a view to the encouragement of the Mysore manufactures.

Resolved 1st—That the raw silk offered for competition for the 1st Government Prize by Messrs. Minchin and Groves, being both of such superior quality, especially considering that it is the result in both cases of the first year's attempt to cultivate that article, and the merits of both being so nearly equal as to render it next to impossi-

The Government was of opinion that the more successful competitor, Mr. Groves, should alone receive the higher reward of 300 rupees. ble for unpractised eyes to determine which is the best, that a respectful recommendation be forwarded to Government, advising that, with a view to encourage further efforts to bring this valuable article of commerce to perfection, a prize of 300 rupees be awarded to each.

Resolved 2nd—That Government be recommended to award the 2nd prize, rupees 150, to Mahomed Cassim, the only native competitor who has brought the amount (22 lbs.) of silk necessary to compete for the 2nd prize, under the terms of the Government proclamation of 10th May 1844.

Resolved 3rd—That Government be respectfully requested to award a donation of 75 rupees to Padsha Saib, the only other native who has produced any silk for competition for the 2nd prize, in consideration of his losses, and of his having been the first person who attempted the culture of silk-worms in the town of Madras.

Resolved 5th—That Monsieur Perrottet be informed that the Committee are of opinion, that silk the product of Foreign territories, cannot be admitted to compete for the prizes offered by Government, under date the 10th May 1844.

Resolved 6th—That the Silk Fabrics of the Mysore territories forwarded by the Secretary to the Mysore Commissioner, be exhibited at the Society's show, in compliance with his request.

(True extracts,)

F. S. GABB, *Captain,*
Secretary.

SUGGESTION FOR IMPORTING MELON AND ONION SEED FROM EGYPT.

*Extract of a letter from G. C. CHEAP, Esq., dated Bauleah,
4th July, 1845.*

"As a reader regularly of your Agricultural and Horticultural Journal, let me suggest your printing among the extracts what is in Wilkinson's new work* on Egypt and Thebes, Vol. I, from page 457 down to "always in arrears," at page 468. So many things in Egypt reminded me of India when I was there for three months, that I am sure that with a little trouble we should have their melons and other esculent vegetables which are very fine; and the *Lupins* which the poor people are so fond of, and from being so cheap much used as

* The work is too dear to get into the hands of every one.

food, would be a great deal better than *gram*, which the Bengalees are so fond of. All my onion and melon seed failed, or I should have sent the Society some, and I strongly advise their importing some of the Egyptian melon and onion seed, which would, I am confident, thrive about Patna and Baugulpore; Bengal is too damp for them."

THE PRODUCTIONS OF EGYPT.

The inundation of the Nile, which commences about the beginning of June,* is generally admitted into the canals of the interior about the first fortnight in August; and the water, gradually extending over the country, soon forms a large lake on the inner or desert side of the cultivated land. It begins to subside in September, or early in October, and as it quits the soil they sow clover and several leguminous plants.

Barley and wheat, which are carried, the former in the fourth, the latter in the fifth month, are sown about the middle of November;† and at the same time that a crop is raised on the land the water of the Nile has just left, another is procured by artificial irrigation. The land at a distance from the Nile is considerably lower than that of the banks, as may be seen from the above circumstance, and from the height of the dykes, which, near the river, are frequently on a level with the soil. Tillage is known to elevate land, and this difference has been here attributed to constant cultivation; but the continued current which at that time runs along the inner side of the lands, tends also considerably to lower their level. Some parts of Egypt are much lower than others; as, for instance, from Girgeh to near Minieh; but, during a low inundation, even these are not all overflowed.

* About Cairo. At Asouan, about the end of May, or the very commencement of June. Beneca says, very simply, "Primum incrementum Nili juxta insulas. . . . Philas noecitur."

† The time, of course, depends greatly on the duration of the inundation.

The principal plants of the winter season, grown after the inundation, are:—

Eng. Name.	Arabic Name.	Botanical Name.	Observations.
Wheat	Kumh	<i>Triticum sativum</i> , L. 6 varieties.*	Five varieties bearded; reaped beginning of April. U L.E.†
Barley	Shayeer	<i>Hordeum vulgare</i> , L. 2 varieties.‡	Reaped, some after 90 days, some the 4th month; sown also at other times. U. L.E.
Beans	Fool	<i>Vicia faba</i> , L.	Sown in Oct. or Nov.; cut in about 4 months. § U. L.E.
Peas	Bisilleh	<i>Pisum arvense</i> , L.	Sown middle of Nov.; ripen in from 90 to 100 days. U. L.E.
Lentils	Ads	<i>Ervum lens</i> , L.	Sown middle or end Nov.; cut in 100 or 110 days. U. L.E.
Vetches	Hommos	<i>Cicer arietinum</i> , L.	Ditto. U. L.E.
Lupins||	Termes	<i>Lupinus Termis</i> , Fors.	Ditto. U. L.E.
A sort of clover.	Bersim	<i>Trifolium Alexandrinum</i> , L.	Sown beg. of Oct.; first crop after 60 days; 2d other 50 days; 3d left for seed; continued by irrigation for a 4th crop, but then no seed. U. L.E.
A sort of clover	Hélbeh	<i>Trigonella Fœnum græcum</i> , L.	Young stalks eaten; also used for clover; sown mid. Nov.; one crop only in about 2 months; ripens in 110 days. || U. L.E.
	Gilbán	<i>Lathyrus sativus</i> , L.	Eaten by ruminating animals, instead of clover, after 60 days: seed ripens in 110; when young they eat its stalks; and the seeds are ground with corn for bread. U.E.
A sort of French bean	Lóobieh	<i>Dolichos lubia</i> , Fors.	Sown at the same time as wheat; ripens in 4 months; and by the <i>shadoóf</i> in Aug., and ripens in about 3 months; for cooking, the beans are gathered in 60 days. U L.E.
	Gishrungayga	<i>Phaseolus Mungo</i> , L.	Ripens in 6 or 7 months; to S. of E' Soóán.

* 1. Towálee, long-eared wheat.—2. Dthukr Yoosefee, with large ear, of which the beard alone is black.—3. Naygeh, small ear, the husk of the grains black as well as the beard.—4. Zerra e' Nebbes, not bearded, of a reddish colour; very small quantities met with in the midst of the other wheat.—5. Moghyus, short broad ear: mostly in Lower Egypt.—6. E' Tubbánee, white; the common Egyptian wheat.

† *i. e.* cultivated in Upper and Lower Egypt.

‡ 1. E' Tubbánee, white.—2. E' Gennáree, red; high growth. Grown in equal quantities.

§ Much depends, in all these crops, on the time of sowing, the state of the land, and other circumstances. Sometimes they are sown without the use of the plough, in the mud, immediately after the water has left the surface.

|| The stalks yield the charcoal for gunpowder. Mohammed Ali has introduced the Kordouh lóobieh for this purpose.

Eng. Name.	Arabic Name.	Botanical Name.	Observations.
Safflower	Kórtum	<i>Carthamus tinctorius</i> , L.	The flowers used for dyeing are called O'sfor; the seeds give an oil (Zayt hélwh;) sown mid. Nov.; seeds ripen in 5 months. U.L.E.
Lettuce	Khus	<i>Lactuca sativa</i> , L.	Lettuce oil is extracted in Upper Egypt; seeds ripen in 5 months; sown middle November.
Flax	Kettán	<i>Linum usitatissimum</i> , L.	Its oil called Zayt har; sown mid. Nov.; plucked in 110 days. U.L.E.
Cole-seed	Sélgam	<i>Brassica oleifera</i> , L.	Yields an oil; sown middle Nov.; cut in 110 days. U.E.
Tobacco	Dokhán béledee, or akhder	<i>Nicotiana tabacum</i> , L. <i>Nicotiana rustica</i> , 2 var. (?)	Sown beg. Nov.; first crop in 100 days; 2d in other 60; 3d in 20 more: this last is called ribbeh.* One variety has the leaves long and lanceolated, with a pink flower: this is the best and mildest, called béledee, or native. The other, with yellow flower, called Lângee, or Bút-hágee, has the leaves round, thick, and of a darker colour, strong, and only mixed with the former or used as snuff.† U.L.E.
Hemp	Bust, hashísh, the dagha of the Hot-tentots ‡	<i>Cannabis sativa</i> , L.	Employed only for its intoxicating qualities, and then called Hashish; sown mid. Dec.; ripens in 4 months. U.L.E.
Cummin	Kamóon	<i>Cuminum Cyminum</i> , L.	Sown mid. Dec.; cut in 4 months. U.L.E.
Coriander	Koósbera	<i>Coriandrum sativum</i> , L.	Ditto. U.L.E.
Poppy	Aboon'om or Aboonúme	<i>Papaver somniferum</i> , L.	Sown end Nov.; the opium taken in the mid. March; seeds ripen in April, the best bought from the peasants, at 45 piastres the roil; grown for the China market. U.L.E.
Water-melon	Bateékh	<i>Cucurbita citrullus</i> , L.	And about 10 other cucurbits; cut in 90 days; sown mid. Dec. U.L.E.
Cucumber	Kheéar	<i>Cucumis sativus</i> , L.	And about 7 other cucumis; cut in 60 days. U.L.E.
	Doóra sáyfee or baalee §	<i>Holcus sorghum</i> , L.	Besides the crop raised by the <i>Shadoof</i> , and that during the inundation; sown mid. Nov.; ripens in five months and a half. U.L.E.
	Doora Hámra	A variety.	With the Baalee. U.L.E.

* Ribbeh, gain, interest, or usury.

† In Egypt and Nubia, snuff is often used in the mouth instead of the leaf. Its strength is increased by adding natron.

‡ In India, bang or gunga.

§ So called from ripening in the summer. It is a variety of *H. Sorghum*. If the seed of the

The plants of the summer season, which succeed either immediately or after a short interval, are produced solely by artificial irrigation. The water is raised from the river by rude Persian wheels, or by the *shadoof*; which last is frequently employed in the inland canals, the Bahr Yoosef, and the wells near the edge of the desert. Nor is its use confined to the productions of the summer; it is always requisite for some of them in the spring, and frequently throughout the whole winter, and even autumn, if the inundation is deficient.

The chief productions of the summer, sown the half year before, and during the inundation,* are—

Eng. Name.	Arabic Name.	Botanical Name.	Observations.
Rice	Rooz or Aroóz	<i>Oryza sativa</i> , L.	In the Delta and Oasis. The best is from about Menzaleh; that of the Oasis an inferior variety; carried in 7 months.
Indian corn	Doóra shámees	<i>Zea mays</i> , L.	Called Syrian Doora; mostly in Lower Egypt; cut in 70 or 75 days; sown one month after the D. Saffra. U.L.E.
A red grain- ed variety Doóra of the heat	Doóra Kaydee	Var. <i>Holcus sorghum</i> , L.	Ditto.
D. of the autumn	D. Byoód or D. Dimeéree	Id.	Mostly in Upper Egypt; sown beg. or end of April; cut at rise of Nile, 100 days; its ear larger than the D. Saffra; its seed is sown as Byoód. U.L.E.
Bending D. Yellow D.	D. Owaygeh D. Saffra	<i>Holcus compactus</i> , L. Included with the H. Sorghum, L.	Sown mid. Aug.; cut in 4 months, but its seed being no longer prolific is all used for bread.
Red D.	D. Hámrá	A var. of H. sorgh.	Grows with the D. Kaydee. Cut in winter; sown when the Nile is at its height, in mid. of Aug., and banked up; ripens in 120 days. U.E.
			Cut also in 120 days; mostly in southern provinces; sown mid. Aug.; mixed with the Byoód; seed red.

D. Kaydee is sown as baalee (*i. e.* in Nov.) it produces seed; but if that of the baalee is sown as kaydee (*i. e.* in April), it springs up, but is barren. The baalee seed is sown as byoód, and *vice versa*.

* At the commencement of the inundation, the children of Thebes light torches made of reeds or palm-trees, and run about the villages, striking each other with these burning brands. It is said to be an old custom handed down from the ancient Egyptians. Formerly children of a larger growth joined in this amusement.

Eng. Name.	Arabic Name.	Botanical Name.	Observations.
Falling D.	Furayt* or Khorayt	H. bicolor, L.	Grows with D. Saffra, but ripens in about 90 days. U. L. E.
Millet	Dokhn	Holcus saccharatus, L.	Only about Asouan, in Nubia, and the Oasis; sown same time as the Doôra.
Sugar-cane	Kassob	Saccharum officinarum, L.	It is planted twice in the year; that in May is gathered in Nov. and Dec., at first it is constantly irrigated. If cut, or broken at the root, and then watered for the ensuing year, it produces several shoots, which, though not arriving at the height of the first year's cane, yield better (but less quantity of) sugar: this crop is called Khilfeh; planted horizontally, in slips. U. E.
Cotton	Kotn	Gossypium herbaceum, L.	Planted in March,† and summer; gathered in Nov., Dec., Jan.; renewed every third year from seeds; in good soil, some is gathered in the fifth month. U. L. E.
	Sîmsim	Sesamum orientale, L.	Gives the oil called séerig; ripens in about 100 days, at the time when wheat is sown; 10 days after the D. Byood. U. L. E.
Coffee	Bon or bunn	Coffea Arabica, L.	Grown about Bendot, near Kénch; does not answer.‡
Indigo	Neéleh §	Indigofera argentea, L.	Sown in April; cut first time after 70 days; 2d after 40; 3d after 30; 4th in 25, in first year; they then leave it without water all the winter, and water it again in March; in 40 days cut first crop; 2d in 30; 3d in 30: third year the same. After three years renewed from seed; first year's crop the best. 1 kantar (of 500 rotl) is sold for 5 and 7 real; 1 feddan gives from 2 to 2½ kantar. U. L. E.

* So called from the seed falling, on being struck, or under heavy wind. They do not use its grain.

† About the 28th of March they sow the cotton seeds, at two paces apart, three or four seeds being put in together.

‡ The Nubians use the seeds of the Karikadán, *sida nutica*, for coffee; but they generally mix them with a little coffee, of which they have the effect of increasing the bulk, and spoiling the flavour.

§ This signifies blue, but not in the Arabic of Egypt. El Neel, a general appellation for large deep rivers, seems to have been borrowed from their blue colour.

Eng. Name.	Arabic Name.	Botanical Name.	Observations.
Gerow			Sown at the high Nile, 1st week in Sept., cut green for fodder after 30 days.
Madder	Foóah, or doódeh Hénneh*	Rubia tinctorum, L. Lawsonia spinosa et inermis, L.	Its long roots give a dye. U.E.
Water-melon	Bateékh	Cucurbita citrullus, L.	Mostly in Lower Egypt; also in Upper Ethiopia.
Onion	Bus'sal	Allium cepa, L.	And the other cucurbites; during rise of the Nile, and in March in the sandbanks of the river. Those from Brulos considered the best.
	Bam'ia towéeleh	Hibiscus esculentus, L.	Sown in August; when young gathered for use, or transplanted about end of Feb.
	Bamia béledec or wáyka	Hibiscus præcox, Fors.	Mostly in gardens; gathered in 50 or 60 days; in Sept. and Oct. It suffers from cold, and will not thrive in winter. U.L.E. Ditto.

Besides a number of vegetables, which are raised at different times by means of artificial irrigation.

Fruit†, which are for the most part grown in the gardens about the principal towns, or in the Fyoóm, succeed each other in the following order:—

Eng. Name.	Arabic Name.	Ripen in
Mulberries	Toot béledec, shámeé	January.
Seville oranges	Narfng, 3 var.	January.
Rhamnus nabeca, Fors.	Nebk, or Sidr	March, April.
Cucifera Thebaica	Dôm, or Dome	April.
Apricots	Míshmish	End of May.
Peaches	Khokh	Middle of June.
Apples	Tefáh, or Teffáh	End of June; mostly from gardens of Mount Sinai.
Pears	Koomittree	End of June.
Ceratonía siliqua, L.	Kharóob	June.
Plums	Berkoók	

* The use of this as a dye for the feet and hands is very general. Some have derived the rhododactylos Eos from this eastern custom. The leaves are pounded, and, being made into a paste with cold or warm water, are applied to the hands and feet on going to bed, in the same manner as a poultice. When taken off, a red dye is left on the nails and other parts of the hands and feet; and another application of a mixture of soot and lime is sometimes applied to change it to a dark olive or blackish hue. New hénneh is preferred, and that quality which gives a deep colour.

† Cherries are unknown in Egypt, but it is a curious fact that the ancient Egyptians sometimes covered their bows and walking sticks with cherry bark; like the modern Turkish pipes.

Eng. Name.	Arabic Name.	Ripen in
Grapes	E'néb béledee	End of June and beginning of July; black and white.
	Fyoómees	— White.
	Sherkúwee	— Black, bad.
	Hegázee	— Mostly brought dry from Arabia.
	Roomes	— Large, black and white; origin Greek.
Figs	Tin Bershoómees	July.
Sycamore figs	Tin gimmáyz	From April to September.
Prickly pear	Tin Seraféndee	End of July.
Cactus opuntia, L.	Tin shók, or shoke	
Pomegranates	Roomán	August.
Lemons	Lemóon malh, 4 var.	August, and other seasons.
Dates	Bellah, about 20 var.	End of August.*
Citrus medica, var. 8. and 9., L.	Troong, 2 var.	September.
Oranges	Portogán báledee	20th November, but still rather sour.
	Itashódee	
Sweet lemons	Lemoón helwh	
Banana, Musa paradisiaca	Móz, or Moze	November.

The dates sold in Egypt are of several kinds, some natives, and some imported from other countries. The most common are,—

Bellah Séwee, which consist of—

Soltánee	} From Seéwah.
Sáidee	
Fráhee	
Káibee	
Ghazálee	
Roghm Ghazálee	} From El. Koráyn.
Bellah Aamree	
Amhát	
Menawátee	
Benáysh	
Hyánee	Rosetta, and about Cairo; red.
Soft é dénééh	Menawát, and about Cairo; yellow.
Semánee	Salhééh; red. Used for agweh (preserve).
Bróolosee	Birket el Hag.
Sobác e'sít	Rosetta.
Kobáshee	Ibid.
Ibrémees	Broolos, or Bourlos.
Sélgee	Originally from the Hegaz.
Suffee	Ditto.
Keroón el Ghazál	From Ibreem, Nubia.
Sakoótee	Imported from the Hegaz.
Yemenee	Ditto; stone very small.
	Hegaz (Arabia).
	Ditto, and Oasis.
	from the Yem'en, &c.

Though the time of sowing the winter and summer plants is in some degree fixed, much of course depends on the continuance of

* About the 28th of March, they tie some of the blossom of the male to that of the female palm trees.

the inundation; and many of them, by means of irrigation, are raised at other seasons.

Besides, the productions of the valley of the Nile vary in different provinces; and some belong almost exclusively to certain districts. Clover, so abundant in the Delta and Lower Egypt, is rarely cultivated in the Thebaïd, where its place is supplied by gilbán. Rice exclusively belongs to the Delta and Oases; and cole-seed, gortum, poppies, and lettuce are nearly confined to Upper Egypt, where also the greatest quantity of holcus is cultivated. Date-trees are more abundant in the north; and vines, figs, roses, and olives, are limited to the Fyoom and the gardens of large towns.

The advantages which some species of crops have over others are a matter of little interest to the peasant, whose preference is not consulted; but this evidently leads to many unfair and oppressive measures on the part of the shekhs, whose office it is to select as well for *themselves* as for those under their authority. The expense and outfit of water-wheels and their oxen is undertaken by the Government, and afterwards repaid by the peasant, either in money or produce; and the quantity of land each wheel irrigates depends on the nature of the crop.

To give an idea of the value and the returns of different produce, the profit or *loss* of the peasant, and his real condition, I shall introduce a brief statement of the particulars of each, collected in 1827.

1	Water wheel, with 8 oxen	irrigates 3 feddân	of cotton.
1	..... wheel, .....	..... 7 feddân	of wheat.
1	..... wheel, .....	..... 2 feddân	Doora kaydee (gaydee).
1	..... wheel, .....	..... 8 feddân	Indian corn.

The produce of the *best* land is as follows:—

Val. in Piast.				P.
1 fed.	gives 2½ qant.	cotton, best	120 the kantâr*	in 12 months | total 300
1 fed.	.. 8 ard.	wheat	38 the ardeb†	in 4 m. 20 d. | .. 304
1 fed.	.. 12 ard. ‡	Doora kaydee	16	in 3 m. 10 d. | .. 192
1 fed.	.. 5 ard.	Indian corn	16	in 2 m. 15 d. | .. 80

Val. in Piast.			
8 ard. of wheat	give 10 camel lds.	of straw	2 the load
12 ard. doora	.. 15	fodder	2
5 ard. Ind. corn	.. 5	do.	2
			in 4m. 20 d. | total 20
			3m. 10 d. | .. 30
			2m. 15 d. | .. 10

Calculation by the water-wheel. Cotton.

3 feddân | with 1 wheel | give 7 kan. | of cotton | value 900 piast. in 12 months.

* Valued nominally at 150 piastres by the government, but 120 are alone paid. Inferior cotton is at 75, and even at 50.

† This is the best land, and only in a few parts of Egypt. The price of corn varies in different years, from 2½ to 50 piastres.

‡ In some low land near Abydus, capable of constant irrigation, it has been known to produce 18 ardebs.

<i>Corn.</i>				<i>Val. in Piast.</i>	
The 7 feddán	with 1 wheel	gives 56 ardebs	of wheat	2128	in 4m. 20d.
2 of those 7 fed.	{ with 1 and the same wheel .. }	.. 24 ard. ..	Doora kayd ..	384	.. 3m. 10d.
8 feddán. ..	with the same	.. 40 ard. ..	Ind. corn ..	640	.. 2m. 15d.
The wheat ..	in addition..	gives 70 loads -	of straw	140	
D. kaydee..	.. .. .	.. 30	fodder	60	
Ind. corn ..	.. .. .	.. 10 .. ..	.. .. .	20	
Total,				3372 in 10m. 15d.	

or allowing for clearing, loading, and ploughing, with about one month and a half of inundation, twelve months. From this it is evident that the culture of the cotton is very disadvantageous to the peasant, whether calculated by the feddán or the wheel; even if we add the value of a crop of corn raised at the same time as the cotton, which will be mentioned presently.

The land tax (taking as above, the best land) is as follows:—Tax 40 real, or 90 piastres, for 1 feddán, producing $2\frac{1}{2}$ quant. cotton, value 300 piastres per annum, leaving an apparent balance for 1 feddán, 210 piastres, without deducting for the expenses of the wheel and the other taxes.

Takawee * $\frac{1}{2}$ ardeb 19	} for 1 feddán	producing 8 ardebs wheat	304	} per an
Tax 40 r. or .. 90		12 ard. doora ..	192	
1 load straw .. 2		5 ard. Ind. corn ..	80	
111		10 loads straw ..	20	
		15 fodder	30	
		5 ditto	10	
			636	

leaving the apparent balance for 1 feddán of corn, 525 piastres.

To calculate by the wheel :

3 feddán, 1 wheel, $7\frac{1}{2}$ quantars cotton, 900 p. minus tax 270 p.	P. 630
By the same wheel may also be cultivated 7 feddáns of wheat, 218 p. }	1351
or, deducting the tax of 777 p... .. .	1981

Leaving the balance 1981 piastres in the hands of the peasant, to meet the expenses of the water-wheel and the additional taxes.

But let us take the most favourable crop : —

<i>Cost.</i>		<i>Produce.</i>	
Takawee (seed) for 7 fed. 133	} 1 wheel gives annually	56 ard. wheat, on 7 fed. ..	2128
Land-tax (best land)		24 ard. doora, on 2 fed. ..	384
Seven loads of straw		40 ard. Ind. corn, on 8 f. ..	640
Takawee for 2 fed. doora .. 16		straw	140
for 8 fed. Ind. corn. 32		fodder	60
825		fodder	20
			2372

* Seed borrowed from Government.

Balance 2547 piastres for one wheel in favour of the peasant; from which we have to deduct the expenses of the water-wheel and the other taxes, which are as follows:—

I.—*Outfit of Wheel.*

1 water-wheel, wood, &c.	..	..	..	P.	200
Digging the well	..	..	..	..	50
Building the same	..	..	..	..	350
8 oxen	..	..	..	..	600

For the first year .. Total, 1200

II.—*Annual Expenses.*

P.

12 ardebs, beans for the oxen	..	192
Fodder	..	160
4 feddán gilbán	..	288
Pots, annually	..	15
Man, 3 ardebs grain ann.	..	70
Carpenter, 3 ardebs	..	70
Grease, 6 rotl.	..	6
Wood	..	15
7 ropes	..	56
Large ropes	..	6
2 sets of harness	..	6
6 men's pay (1 at 40 fodtha a day, 5 at 20 f.) annually	..	1278

2162

III.—*Additional Taxes.*

P.

For 7 feddán he is to supply 21 rotl of butter, bought by the Government at a loss to him of	5
House-tax of owner of the wheel	150
Wool, 20 f. a month	6
Charge when recruits are levied	8
Annual expenses	169
Outfit of wheel, first year	1200
Net produce	3531
Loss to the peasant, first year	948

Second Year.*

Second Year.

Annual expenses	..	..	2169
Additional taxes	..	..	169
			2331

Net produce	..	..	2547
Expenses, &c.	..	..	2331
Balance in favour of peasant the second and ensuing years,	..	..	216

From which he has to make up his first year's loss. Hence it appears that four years must elapse ere he can pay the arrears for the original expense; and still during this time he and his family are to be provided for from the same funds. Those who plant cotton are of course much greater losers;† and besides the above taxes, palms and other trees, which do not repay the peasant, should be taken into account.

I shall now calculate the produce of a piece of land I measured at El Byrát, near Thebes, of the mean quality, and paying 40½ piastres annually. This land produces the autumn crop of wheat, like all that which the Nile has sufficiently irrigated, without a water-wheel; and, on making an exact measurement, I found that one feddán gave two

* A water-wheel lasts about eight years; by which time another set of oxen is generally required.

† In the proportion of about eleven to seven.

ardebs and seven mids ($2\frac{1}{2}$ ardebs), which, at the market price, was valued at $22\frac{1}{2}$ piastres the ardeb, making nearly $64\frac{1}{2}$ piastres.

<i>Produce.</i>				<i>Tax and Expenses.</i>			
		P.	F.			P.	F.
Wheat $2\frac{1}{2}$ ardebs	64	Kharag (land-tax)	..	40	20
3 loads straw	6	Tagawee $\frac{1}{2}$ ardeb	..	11	10
				Ploughing, hire, &c.	..	4	20
			70	Reaping..	..	3	0
			20	Carrying..	..	1	20
Deduct expenses..	64	Threshing (3 roftows, hire)	..	2	8
				Winnowing ($1\frac{1}{2}$ roftow)	..	1	4
Balance in favour of peasant							
for 1 feddán	6			64	0
			20				

But my measurement, being taken with a line, gives the real contents of the feddán; whereas, their mode of measuring with the pole, greatly increases it; so that one feddán will be reckoned at least $1\frac{1}{2}$ f. or about $6\frac{1}{2}$ piastres over the just tax, being equivalent to the surplus of the produce.

The consequence of this is, that the peasant *steals** as much as he possibly can from his *own* grain, which indeed necessity obliges him to do; and the only resource left besides stealth, to enable him to support himself and family, is to raise a crop of wheat and barley (called shitwee, "of the winter") which he sows and waters by the shadoof, during the time that the wheat of the lowlands is growing up without any artificial irrigation. Nine men join in raising this crop, and four feddán, half wheat and half barley, are watered by the shadoof.

Produce.

2 feddán	..	..	..	give 16 ardebs	†	..	..	wheat at $22\frac{1}{2}$ piastres	P.	360
2 feddán	..	..	..	20 ardebs	..	..	..	barley at 16	..	320
				20 loads	..	..	..	straw at 1	..	20
				20 loads	..	..	..	straw at 1	..	20

720

Expenses.

Tagáwee (seed)	1 ardeb wheat	..	..	..	..	..	..	P.	22½
	1 ardeb barley	..	..	..	..	..	..	16	
Shadoof ("pole and bucket")	wood, &c.	..	..	..	..	..	..	3	
buckets, 2 sets	..	..	..	..	..	..	..	9	
Implements	..	..	..	..	..	..	..	10	
Kharág (tax) for 4 feddán, at Koorneh, 40½	..	..	..	..	..	..	..	162	
Government land-surveyors, to prevent imposition	..	..	..	..	..	..	..	5	
Loss on butter	..	..	..	..	..	..	..	5	

232

* When the whole crop is taken by the government; in which case the ardeb rises speedily from $2\frac{1}{2}$ to 30 and 40 piastres or upwards.

† I have calculated the taxes, as at Koorneh, and yet allowed the best land; and in no part of these calculations have I reckoned the items which increase the loss of the peasant; as claims of the shekh, Copt scribe, &c.

which, deducted from the produce, leaves $487\frac{1}{2}$ piastres; and this, divided between the nine men, gives to each about 54 p. 7 f.

After this, a second crop is also raised by the shadoof, called káydee (or gáydee "of the heat"), and nine men sow two feddán of doora káydee.

<i>Produce.</i>		<i>Expenses.</i>	
	P.		P.
2 feddán give 24 ardebs, at 16	.. 384	Takáwee ..	14
(no fodder taken from it)		Shadoof buckets	9
		Tax	81
		Surveyor's fee	2
		Grease for the bucket	2
			<hr/> 108

leaving 276 piastres, or about 30 p. 27 f. to each man.

A third crop is afterwards raised of doora shámees (Indian corn) called dimeerees "of the autumn," by five men, who sow three feddán with the shadoof.

<i>Produce.</i>		<i>Expenses.</i>	
	P.		P.
3 feddán give 15 ardebs Indian		Tagáwee	5
corn, at 16	240	Bucket	3
fodder	10	Tax	121 $\frac{1}{2}$
Sown also (with the Ind. corn)		Surveyor's fee	4
gerów, worth	25		<hr/> 133 $\frac{1}{2}$
	<hr/> 275		

which leaves $141\frac{1}{2}$ piastres to be divided between the five men, being 28 p. 12 f. to each. The sum of the net receipt for these three crops is then as follows to each man:—

		<i>Additional Taxes.</i>	
P.	F.		P.
54	7	House, for one of the poor class	40
30	27	Wool	4
28	12	Recruits, expenses for	2
		Butter, loss on	4
<hr/> 113	<hr/> 6		<hr/> 50
annually			

leaving for his annual expenses 63 p. 6 f., about 18 shillings English, not 7 foddas, or $2\frac{2}{5}$ farthings a day.

This is making the utmost allowance; for it is rarely the case that three crops are raised in one year, independent of that upon the inundated land; and the numerous exactions of the provincial governors have the invariable effect of leaving the peasant *always in arrears*.

ON THE PRODUCTION OF SOILS AND MANURES BY THE LOWER ORDERS OF PLANTS.

By ROBERT D. THOMSON, M.D., Lecturer on Practical Chemistry in the University of Glasgow.*

The intimate connexion subsisting between the soil and plants might have led, one would have supposed, to an early appreciation of the fact that vegetables extract nourishment from the earth. Jethro Tull, however, informs us that, antecedent to himself, (in 1732,) no one having alluded to the subject, he was under the necessity of inventing a term to express what he meant by the method in which inorganic nourishment was taken up by plants. He termed it the *pasture* of vegetables; for he was quite convinced that, as cattle feed on vegetables that grow upon the external surface of the earth, the plants themselves must first receive from within the earth the nourishment they give to animals. By pasture Tull did not understand the pabulum itself, but the superficies from whence the food was received. By this term he meant the spaces between the particles of soil, and upon the surface of these particles he believed the roots of plants to pasture, or to imbibe, by their appropriate apparatus fine portions of the soil. He argued that much nourishment cannot be derived from rocks or soils without interstices; and that, in proportion to the porous nature of the earth, or, in other words, to its fine state of division, is its fertility enhanced. The earth, he affirmed, is not deprived of its fertility by any other means than by fire and the roots of plants; for when vegetables are not allowed to grow on a soil, the latter will always grow richer. The operations of ploughing and harrowing, the circumstances of exposure to the sun, to the frost, to the action of water, and to mechanical pulverization, will only contribute to render the earth more fertile, provided fire and plants are withheld from acting upon it. By his sagacity in detecting this source of the nourishment of plants, Tull abolished the Virgilian agriculture in England, and produced a new era in the science, from which may be dated the commencement of all modern improvements in farming.

It is not a little remarkable that so acute a man as Lord Kames should have endeavoured to supplant the great doctrine of Tull by the old idea that the only use of the soil was to give support to the plant mechanically, and to hold water for its nourishment. Mr. Kirwan was

* Forming a Lecture delivered in the University of Glasgow.

one of the first chemists who subjected the ashes of plants to examination, and he was succeeded by Saussure and Davy, who clearly demonstrated that the inorganic materials of vegetables were essential to their constitution. Saussure did not seem, however, to consider the vegetable matter of the soil as of any further utility than as supplying ashes or inorganic materials in a fluid form to the roots of vegetables; for he observes that the oxygen of the air removes carbon from the humus. The humus, in losing this element, gives off, at the same time, under the form of water, its oxygen and hydrogen, and an extract soluble in water. Hence the mould or humus appeared to him to be capable of entire decomposition at the usual temperature of the atmosphere, while the soluble extract, the residue of the decomposed humus, contributed in a certain proportion to its fertility, in consequence of the ashes of the extract containing all the principles of the ashes of vegetables.

It is quite obvious, therefore, from these views, that Saussure entertained no ideas similar to those of the *humus* theory, which, originating in Sweden, and passing into Germany, attracted a number of supporters, but never made its way into this country. Liebig, it is sufficiently well known, has in a great measure destroyed the basis upon which this highly improbable theory was raised, and has contributed essentially to supply us with more precise notions of the nature of manures, by demonstrating that it is upon the inorganic constituents rather than upon their organic ingredients that the value of manures depends.

Argument in favour of the inorganic nature of manures.—The humus theory, which consists in supposing that decayed vegetable mould dissolved in water is capable of being taken up by plants, and supplying them with most of their solid nourishment, seemed still, however, to receive some support from the class of plants termed lichens, so common upon our rocks, trees, and walls. It was believed by botanists that this lowly order of plants was destitute of roots, and that the seeming roots which retain them so closely in contact with the surface of rocks and trees, were designed for the purpose of fixing the plants in their place, and not for the sake of supplying them with nutriment, which was afforded solely by the air. If this view were correct, then it would follow that these plants could contain none of the ingredients of rocks, or, in other words, that lichens must be destitute of inorganic constituents, and that, if the humus theory be inaccurate, the mould produced by the decay of lichens cannot act as a source of nourishment to future vegetables. Now it is generally admitted that lichens are active producers of soil, and that they afford a mould for other plants

to flourish in; hence they appeared to supply a strong argument for the humus theory. The experiments which we have made, however, in the Glasgow laboratory last year, have clearly demonstrated that the lichens afford the most powerful of all arguments against the humus theory, and present a beautiful illustration of the great work performed in nature by the lowest members of the vegetable kingdom. Our experiments also shew that lichens, contrary to the opinion of botanists, must be supplied with roots possessed of greater power than those of trees or herbs, and that, of all orders of plants, their capacity to take up inorganic matter, and deposit it as part of their constitution, is alone surpassed by the sea-weeds which, however, are surrounded on all sides by a nutritious inorganic atmosphere.

It was known that some lichens contained one or two inorganic constituents; but these were considered to be partial facts, and it does not appear to have occurred to chemists that inorganic matter is an essential ingredient in this class of plants. On heating 50 grains of a carefully picked specimen of *Parmelia parietina*, the yellow wall lichen, a common yellow incrustation on trees, rocks, and walls, I found that, after exposure to the highest temperature, a considerable quantity of matter remained which could not be expelled. The ash weighed 3.4 grains; in another experiment, 40 grains of the same plant left 2.7 grains of ash; and in a third experiment, 7 grains of the fresh leaf, or frond, most distant from the point of attachment to the rock, yielded a skeleton, preserving the shape of the lichen, weighing 0.47 grains, and consisting of silica, iron, and phosphates, &c. These three experiments afford the following per centage:—

1st.	2nd.	3rd.
6.8	6.75	6.71

A considerable portion of the plant was burned; the ashes were preserved and analyzed. The following is the result of two analyses, in which I was assisted by my pupils, Messrs. David and James Murdoch of Stirling:—

	1st.	2nd.
Silica,	68.46	64.62
Sulphate, Phosphate, and Common Salt,	0.75	—
Peroxide of Iron, and Phosphate of Iron and Lime,	22.04	34.55
Carbonate of Lime,	8.75	—

The presence of the phosphoric acid was determined by digesting the precipitate produced on the addition of caustic ammonia in acetic acid, when the perphosphate of iron remained undissolved. These, and the subsequent experiments, were made from the autumn to the commencement of the winter of 1843,* and it is interesting to know that the

* Proceedings of the Philosophical Society of Glasgow, vol. i., p. 184.

results in reference to the presence of phosphoric acid, have been confirmed by analyses made at Giessen, and published in June of this year, (*Annalen der Chemie*, Juni 1844, p. 393.) It is also curious to observe, in comparing analysis made of the same lichens growing on different localities, how much larger the proportion of silica is in those plants which have vegetated on rocks than in those which have lived on the trunks of trees. At Giessen, the lichen under consideration, mixed with some others which were growing side by side on an apple tree, yielded about 50 per cent. of silica, while in the preceding results the amount of this ingredient approached 70 per cent. The specimens subjected to analysis were, however, derived from the surface of the mica slate rocks of Dunoon, in the Firth of Clyde, where a plentiful supply of silica was exhibited to their roots. This result is in accordance with the observation of Saussure, that plants which vegetate upon a mould derived from a siliceous rock furnish—other circumstances being alike—ashes that contain less lime and more silica than those growing upon a calcareous soil. The facts thus developed in reference to one species of lichen, so different from what was to be expected from previous experiments, led immediately to the examination of various other species. A specimen of *Parmelia saxatilis*, a common grey lichen, abundant on rocks and dykes, which had been collected on the banks of Loch Venachar, where it is extensively used by the inhabitants to impart, by means of an alum mordant, a purple colour to woollen cloths, was subjected to analysis—200 grains, when burned, left an ash which weighed 7.8 grains, consisting of substances exactly similar to those which have been described when treating of the yellow wall lichen.

A number of other species, for which I am indebted to the kindness of Dr. Balfour, professor of botany, were also analyzed, and found to afford similar results. The following table contains a few determinations in which I was assisted by my pupil, Mr. George Aitken of Glasgow:—

	Soluble Salts per cent.	Insoluble Salts per cent.	Total Ash per cent.
<i>Cladonia rangiferina</i> ,	9.75	2.71	12.47
<i>Scyphophorus pyxidatus</i> ,			6.09
.. <i>bellidiflorus</i> ,	0.59	0.59	1.18
<i>Ramalina scopulorum</i> ,	0.33	3.84	4.18
<i>Parmelia omiphthalodes</i> ,	0.33	7.79	8.12
.. <i>saxatilis</i> ,			6.91
.. <i>parietina</i> ,			6.75
<i>Cetraria islandica</i> ,			1.84

The ashes of those various species, being tested in the usual way, were found to be similar to the inorganic constituents which have been already described, viz., silica, peroxide of iron, phosphate of iron, phosphate of lime, and carbonate of lime.

Importance of the lowest order of plants in nature.—The examples are perhaps sufficient to enable us to draw the inference that this class of plants constitutes no exception to the rule which seems to pervade the vegetable kingdom, that inorganic matter is important to the life of the species into which it enters as a constituent, just as with animals whose skeletons cannot dispense with the presence of earthy and soluble salts. This view of the composition of lichens enables us clearly to distinguish the position which this lowly order of plants occupies in the economy of nature. In moist climates they are the never-failing tenants of the arid rocks; nor are the tropical stony masses destitute of their presence. On the contrary, they seem to thrive in all seasons and climates—withstanding, with equal facility, the scorching equinoctial heats and the frigidity of the most elevated mountain zones. It is interesting, then, to deduce from chemical details the importance of this extensive distribution throughout the domain of nature. When land first appears above the level of the ocean, one of the first organic beings which makes its habitation on the newly-discovered rock is some one of the species of plants to which we have been directing our attention. The barren island, stony and hard, is unfit for the purposes of supporting living beings until it has been covered with a soil; this is effected by the disintegration of the rocky masses of which the island is composed, by the agency of moisture and heat, aided by other atmospheric causes. But a most important auxiliary is the lower orders of plants, which not only act by the mechanical separation of the particles of the rock, but also by imbibing the most influential of its nutritive ingredients, and bringing to the surface, as it were, a layer of living matter calculated for the support of vegetable beings. These plants, like other vegetables, wither and decay to give place to a rising generation, which continues to extract similar materials from the rock. By continuation of this process, a layer of mould is deposited on the surface of the formerly barren mass, which is now calculated to serve as a place of growth for seeds, wafted by the waters of the ocean, or deposited by wandering wild fowl. There is no reason for inferring, however, that this mould acts upon the plants that grow in it by supplying humus, according to the old view, as a source of soluble nourishment. On the contrary, it may be inferred, from the experiments previously detailed, that the mould produced by the action of lichens,

and the decay of the latter on the surface of rocks, influence a higher order of plants, by presenting to them a focus of the richest food, that has been carefully selected and deposited for their use by this too often despised order of vegetables; for when we compare the amount of inorganic matter existing in different tribes of plants, we find the lichens to be exceedingly rich in this commodity. This is particularly exhibited in the following table, constructed from my examination of lima wood, sapan wood, and sea-weeds, where the composition of 1000 grains of each of the plants is given:—

	Lima.	Sapan.	Lichens.	Algæ.
Organic Matter,	971.25	987.08	932.5	875.3762
Inorganic Matter,	28.75	12.92	67.5	124.7238

The species of lichens whose composition has been here selected are the yellow wall lichen and the rein-deer lichen, so abundant on our moors, while the specimen of sea-weed was brought from Cape Horn by Dr. Joseph Hooker, in the expedition under Sir James Ross, and was of enormous magnitude. That sea-weeds should contain so much saline matter does not afford subject for much surprize, since the waters of the ocean supply an inexhaustible source of nourishment, in which, constantly imbedded and soaked, they can suck in food by every pore. It is different, however, with lichens, which have only one side in contact with the focus from which their inorganic constituents can be derived. It must, therefore, now be an interesting point for botanists to determine the nature of the roots or connecting links between the lichens and the source of their nourishment, which appear to be of such an efficient nature when brought in comparison with other orders of plants.

Mode of discovering the presence of manures in rocks.—But not only has the examination of lichens confirmed the most rational views of the true nature of manures, but it has also supplied us with important information respecting the nature of rocks, and of the useful purposes to which even our giant mountains may be applied for the service of the farmer. An analysis of lichens derived from rocks will enable us to detect from whence supplies of the phosphates and other manures may be procured in the largest quantities, for the presence of these bodies in lichens is a direct demonstration of the existence of the same materials in the rocks upon which they grow. Our supplies of concentrated manures in the form of guano, bone earth, &c., cannot last long; but it is consolatory to think that, in our rocky mountains, there are deposits of food for plants from which these concentrated manures must primarily have been derived, and to which we may again have recourse

directly for stores of manure. It does not seem necessary that the phosphates should be extracted from the rocks in which they are contained by any expensive chemical process; but those masses which may be found by chemical analysis to contain any considerable amount of these salts, might be applied in a pulverized state to the soil directly. The same method of application might also be adopted in reference to the supply of alkalis for agricultural purposes. Many of our rocks, such as trap and granite, which contain abundance of the alkalis, and are susceptible, under atmospherical influences, of rapid decay, might be applied in a pulverulent form to the soil. Immense masses of trap, broken for the purposes of mending the roads at Glasgow, have decomposed in a few months into fine gravel; while every one is familiar with the Cornish clay, used for the manufacture of porcelain, a product of the rapid decomposition of the felspathic constituent of the granite of Cornwall, and whose extrication must have been accompanied with the separation of a large amount of alkalis. All these facts indicate that farmers need not despair of possessing, by the agency of chemistry, inexhaustible sources of manure; for, since all soils must have been originally derived from the adjacent strata, it is sufficiently obvious that new soils may be formed by simple methods.

The experiments which have been detailed in this paper, will, it is hoped, tend to elucidate the important function which the lower orders of plants fulfil in the domain of nature, and they likewise, it is conceived, remove satisfactorily the last argument which remained for the existence of the humus theory.

Air plants require inorganic food.—There still, however, is presented to our notice, a class of plants which might be quoted as proofs of this theory, and, of consequence, as evidence against the inorganic nature of manures. This class is usually denominated air plants; and, from their designation, would appear to feed on air alone. Analysis, however, has shewn that these plants resemble, in every respect, other vegetables; that they contain inorganic matter; and, so far as inference is legitimate, seem incapable of existing without inorganic food. Several species have been analyzed in the Glasgow laboratory; one of these was the *Corallina Skinneria*. The analysis was conducted by my pupil, Mr. John Thomson. Its composition was as follows:—

Water,	79.64
Ashes,	2.02
Organic Matter,	18.34

The ashes, being analyzed, were found to consist of the following constituents :—

Silica,	8.43
Peroxide of Iron and Phosphates,	3.08
Alumina,	6.16
Carbonate of Lime,	40.62
Soluble Salts, consisting of Common Salt, Chloride of Potassium, Sulphate of Soda, containing 12.84 Sulphuric Acid, 3.36 Potash, 13.17 Soda,	42.72

We have thus presented to our notice another illustration of the apparently universal fact, that plants require inorganic matter as an essential element of their existence, and the inference becomes almost inevitable that, if its presence has been overlooked hitherto in any species of vegetable, careful examination will tend to carry out still further the important generalization.

Water incapable of dissolving much vegetable matter.—In connexion with the observations which have been previously made in opposition to the humus theory, I cannot omit to notice the inferences which appear to me deducible from a series of experiments in which I have for some time been engaged on the composition of various waters of Scotland, as they possess such a direct bearing in respect to the influence of dissolved vegetable matter in the nutrition of plants. Liebig, it is well known, in shewing the fallacy of the opinion respecting the influence of humus in the nutrition of plants, proves his point by a *reductio ad absurdum*. He admits, for the sake of argument, that humic acid is absorbed by plants in the form in which it could gain access in largest proportion, and then, from known data, demonstrates that the quantity absorbed in this way could only amount to the most minute fractional part of the weight of the plant. His reasoning is carried on principally by hypothetical instances; but the facts which I have obtained bear out, in a still stronger light, the position which he assumed. I have found that the waters of rivers which are perfectly clear, without being mixed with any perceptible colouring matter, and which have been drained from mosses, and have passed over deposits of vegetable matter in a state of decay, contain one part of vegetable matter dissolved in about 50,000 of water; while, on the other hand, when the waters were very dark coloured, and apparently contained as much vegetable matter in solution as they were capable of taking up, the mean amount in solution was nearly one part in 35,000, while the largest quantity was one part in about 15,000 of water. In the latter cases it was evident

that the water was saturated with the vegetable matter, because, after being subjected to evaporation for a very limited space of time, a deposit of vegetable flocks occurred; and this deposit was also apparent even after filtration, when the water was allowed to evaporate spontaneously. It is evident, therefore, in summer, when waters are clear, that, to communicate 1 lb. of solid vegetable matter, in a state of solution, to a plant, 50,000 times that weight of water would be required—a mode of supply of so slow and inefficient a nature, that but a small fraction of the organic elements of vegetables could be thus imparted. Liebig has supposed the case which he employs as an illustration of a much more favourable nature to the humus theorists. He admits humic acid to be soluble in 2,500 parts of water, on the authority of Sprengel, and humate of lime to be soluble in 2,000 parts of water, and shews that, in a particular case, to produce 2,650 lbs. of wood, 165 lbs. could only have obtained admission in the form of humic acid. This is the most favourable condition. It is scarcely necessary to advance that the results obtained by my experiments are still less in favour of the nutrition of plants by the admission of decomposing vegetable matter in solution to their vessels. Experiments have been made to ascertain how much organic matter could be taken up by water when allowed to digest in the latter. Mould has been treated with cold water, and it has been found that the water remained clear, and dissolved less than 100,000th part of organic matter. This amounts to about one-half the quantity of organic matter obtained as the result of the experiments previously alluded to.

Nature of the effect produced by steeping seeds.—When we are satisfied of the prominent position which inorganic matter assumes in the nourishment of plants, we are in some measure prepared to examine the effect resulting from steeping seeds in saline solutions. Virgil states that he had “seen many persons sowing seeds which had been previously sprinkled with carbonate of soda (nitrum) and black lees of oil, that the seminal produce might be enlarged.”—(Georgic I., 193.)

“Semina vidi equidem multos medicare serentes,
Et nitro prius et nigra perfundere amurca;
Grandior ut fetus siliquis fallacibus esset,”

which has been thus incorrectly translated by Dryden—

“Some steep their seeds, and some in caldrons boil,
With vigorous nitre and with lees of oil,
To swell the flattering husks with fruitful grain.”

The ancients applied the term nitrum to carbonate of soda, and hence the term as employed by Virgil must be so understood. Such

processes have long been employed by farmers, and are familiarly known by the terms brining and pickling. Jethro Tull tells us that brining, as an antidote to smuttiness, was discovered in the following manner, about the year 1660:—"A shipload of wheat was sunk near Bristol in autumn, and afterwards, at ebb, all taken up, after it had been soaked in sea water; but it being unfit for making of bread, a farmer sowed some of it in a field, and when it was found to grow very well, the whole cargo was bought at a low price by many farmers, and all of it sown in different places. At the following harvest, all the wheat in England happened to be smutty except the produce of this brined seed, and that was all clean from smuttiness. This accident has been sufficient to justify the practice of brining ever since in all the adjacent parts, and in most places in England." The same author gives the following process for brining wheat:—"The first thing is to make a very strong brine, (of pure salt,) and, when the wheat is laid on a heap, sprinkle it or lave it therewith; then turn it with a shovel, and lave on more brine; turn it again with a shovel, until, by many repetitions of this, the wheat be all equally wet. Next sift on quicklime through a sieve; turn the wheat with a shovel, and sift on more lime; repeat this sifting and turning many times, which will make it dry enough to be drilled immediately." He farther informs us that when lime has been long slaked—that is, when it has become carbonated—and is, therefore, incapable of extracting, from the surface of the seeds, the water which has been brought in contact with them in the form of brine, it is unfit for the purpose of preparing the brined seeds. Tull was, however, sceptical as to the influence of brining, for he says that smutty seed-wheat, though brined, will produce a smutty crop, unless the year prove favourable; and he conjectures that the Bristol wheat might have been foreign wheat, and from a locality where smut did not prevail.

A common idea entertained by farmers is, that smuttiness is principally confined to wet seasons; and this seems confirmed by the circumstance that we find no allusion to smut in the writings of Virgil, although, by a mistranslation, Dryden has made it appear that such a disease was known to the ancients. The original states, (*Georgic I.*, 150):—

"Mox et frumentis labor additus, ~~ut~~ mala culmos
Easet robigo,"

which the poet translates—

"Soon was his labour doubled to the swain,
And blasting mildew blackened all his grain."

The term in the original obviously relates to rust or blight, and not to smut; hence Dryden would have been nearer the mark if he had used reddened for blackened in the preceding translation.

If, therefore, as would appear from the absence of any notice of smuttiness by Virgil, this disease was unknown in an Italian climate, a powerful argument is supplied in favour of the idea held by farmers that smut is only produced in wet seasons, and the question whether brining is of any service in warding off this disease would still remain open for determination. The same remarks would apply to pickling wheat, so generally employed in the best agricultural districts. It is unnecessary to describe this familiar process, more especially as it has been so well detailed by Professor Low in his excellent work on agriculture. It is only proper to observe that the operation is of the same superficial nature as that of the brining previously noticed; and that the urine with which the seed is sprinkled must not gain access to the interior of the seed, otherwise deleterious effects will undoubtedly ensue. Tull seems to have been acquainted with the process of pickling—he wrote about 1732—and to have been quite aware that the injudicious employment of such operations is fraught with danger, for he says, “If seed-wheat be soaked in urine it will not grow, or if only sprinkled with it, it will most of it die, unless planted presently.” Now all who have read the works of Tull with attention will agree that he was too accurate an observer to have made this objection to the common process of pickling if it had not been founded on fact. If we could suppose that the process of steeping were capable of conveying any nourishment to plants in their nascent state, it would be scarcely possible to employ a more efficient fluid than urine. But the operation of brining, which is popularly held to be efficient for preserving plants from the influence of smut and insects, would lead to the inference that the steeping of seeds has no connexion with the early nourishment of the plant, as we know that potash, and not soda, is the main constituent alkali in white wheat; and, indeed, according to the most recent analysis of this grain, soda appears to be entirely absent. As an answer to the argument that in steeping, the seed may absorb some salts which may afterwards serve as nourishment, we have only to imagine a turnip seed to be subjected to this operation, and then to endeavour to form a notion of the minuteness of the solid matter capable of being taken up by it from the solution in which it might have been immersed. From the evidence before us, it cannot be asserted that brining and pickling are of no practical value. The popular opinion in their favour rather supplies presumption in support

of their employment. At the same time it must be confessed that their use is empirical, and that the recommendation of similar processes, which are in reality merely rude imitations, without affording any explanation of their mode of action, is to practise agriculture in a manner scarcely advisable in the present stage of its progress. We have learned from Tull, as we may from experience, that even the long established operations may prove prejudicial, and mar the object of the farmer, unless they are performed with caution and experience; and we may gather from his advice, that we should have the very best evidence presented to us, before tampering with the safety of our crops, to the detriment of the farmer and injury of the prosperity of the country.

There is a wide difference between the application of chemical principles and that of chemical substances in agriculture. True chemical principles, when rationally applied, must lead to correct results; but chemical substances may be used independently of such considerations, and the results to chemistry and to agriculture must be prejudicial. Agriculture and chemistry are experimental sciences. It is, therefore, necessary, if we expect to make progress in them, that experiments should be made. But, as in the laboratory, agricultural experiments should first be made on a limited scale, and their results carefully tested, before being submitted as facts to the agricultural world.—*Quarterly Journal of Agriculture, January 1845.*

THEORY OF BONE MANURE.

By Mr. J. TOWERS, Member of the Royal Agricultural Society of England.

It is astonishing in how short a time an entire change of opinion may be brought about by circumstances which were not at all foreseen, nor even suspected. Referring to an encyclopædia, in a volume printed in 1836, under the head *Bones*, we meet with the following remarks and conjectures :—

“Bones have been of late years very extensively used as manure especially on *poor lands* and *gravels*.” “By their means large tracts of barren heaths have been converted into fertile fields. Most of the bones procured from London and the manufacturing towns have undergone the process of boiling, by which the *oil* and a great part of the *gelatine*” (or animal jelly) “which they contain have been extracted.” “All those who have used bones extensively, report that little difference can be observed. Some give the preference to those from which the *oil* and *glue* have been extracted; but oil and glue form excellent manure. How is this to be

explained?" "The fat and gelatine being intimately blended with the bony matter, and contained in cavities or cells, may remain a long time in the earth without decomposition. As a proof of this, it has been found that bones which had lain in the earth for many centuries, on spots where ancient battles were fought, afforded on analysis nearly as much gelatinous matter as fresh bones would have done."

This remark, my own experience has partially confirmed; for, upon opening a vine-bed wherein a quantity of cracked ox and sheep bones had been placed in 1836, I found that eight years had produced no apparent change, other than that of discoloration, owing to the deposition of some oxide of iron, which conferred a brown and yellow tint.

I had heard and read much about the ramification of myriads of fine fibrous vine-roots among the tissue and in all the apertures; but am constrained to confess that, while I traced this ramification from some other vegetable roots, I discovered very few from those of the vine. It is stated that the great effect of bones most likely depends on the phosphate of lime—

"But a closer examination of the fields manured with bones has led us to surmise that much of their importance depends on the mechanical texture of the bone, and on its power of absorbing and retaining moisture; for if a plant which vegetates with peculiar vigour in a field manured with bones be pulled up, it will almost invariably be found that small pieces of bone are attached to the roots; and when these are minutely examined, the smaller fibres of the roots will be found to have grasped them, and to pervade their cavities, which will always be found more or less moist."

"The moisture, then, and a small portion of the remaining *gelatine* dissolved in it, form the food on which the plant has thriven. The more the bones have undergone fermentation, the more soluble the gelatine will be. This accounts for the seeming anomaly of boiled bones—they have undergone a fermentation. The residue, although not deprived of all its animal matter, is much more porous, and will imbibe and retain *moisture in its pores*. The food of the plants is here ready prepared and dissolved, and kept in store, without being in danger of being washed through a porous soil, or evaporated by the heat. The solid substance, which is chiefly *phosphate of lime*, has a stimulating effect"—(how stimulating and what does the expression imply?)—"and assists that of the more soluble parts. But phosphate of lime is not soluble in water, and does not decompose readily in the earth; its effect, therefore, is not so great as to account for the general result. In *stiff* clays the pieces of bone are bedded in a tough substance, which prevents their decomposition; and in very wet soils the advantage of these small but numerous reservoirs of moisture is lost. Hence it is easily seen why bones are of less use in such soils."

The above extract, which appears to comprise all that was known or rather conjectured, of the availability of bones as a manure chiefly

for turnips, clovers, and pasture grass; and I give it, not with any view to enlighten the agriculturist, but to demonstrate the contracted limits of our information at a very recent period. Four years only from that time had elapsed, when Liebig's Organic Chemistry announced and proved the very great, nay paramount, utility of "*trustworthy investigations of the ashes of plants*"—the products of combustion, scientifically conducted, with a view to detect the true *inorganic* constituents of each individual.

In attempting to present a tolerably clear and accurate view of the chemical agency of *bones*, I may claim some authority, as perhaps I am now the only chemist alive in whose laboratory the *phosphate of soda* was manufactured, in the large way, for the medical practitioners, soon after its discovery and announcement by the late Dr. Pearson. Before I refer more particularly to a process which will elucidate the entire theory of bone-manuring, it will be right to adduce some facts which have been recorded in the Journal of the Royal Agricultural Society of England. These I find, in the following short letter from the Duke of Richmond, and in a note appended by Mr. Pusey:—

On the solution of bones in sulphuric acid for the purposes of manure.

"MY DEAR PUSEY,—I have not yet received the details of the experiments tried by the Morayshire Farmers' Club with sulphuric acid and bones; but I know that the result has been most satisfactory. On my own farm, which is a light sandy soil, I tried one acre with it, another with guano, and a third with stable-yard dung. Early in November I had a quarter of an acre of each drawn and weighed. The heaviest crop was from the land manured with the sulphuric acid, though it did not cost me above 11s. or 11s. 6d. an acre. I understand also that the turnips came into rough leaf sooner on that acre than on any of the others.—Believe me yours sincerely,

"London, December 9, 1843.

RICHMOND."

Note.—The experiments contained in this letter bears out those of the Morayshire Farmers' Club, the details of which appeared in the last Journal, and affords good hope that this, the most important saving which was ever held in the use of manure, will be found generally useful. For those details I must refer to that paper, merely mentioning now that in one trial a bushel of bones, to which sulphuric acid had been applied, exceeded in its effects six bushels used in the common way.

Mr. Pusey then alludes to the chemical composition of bones, and takes a view of them corresponding in many particulars with that I have already given in the extract from the encyclopædia. Space will not admit of farther quotations; therefore I will at once come to the practical evidence afforded by the processes of the laboratory.

Premising, then, that ox and sheep bones consist (on the authority of Fourcroy and Vauquelin) of—

	Parts.
Solid Cartilages, Gelatine, and Oil,	51.
Phosphate of Lime,	37.7
Carbonate of Lime,	10.
Phosphate of Magnesia,	1.3
	<hr/> 100.

We have 51 parts which can be *partly* extracted in the forms of oil and size by simple digestion and boiling in water, and ~~and~~ wholly decomposed by the agency of combustion. The elements of these 51 parts yielded by combustion, prove them to be oxygen, hydrogen, carbon, and some azote or nitrogen. Now, in our process to obtain Dr. Pearson's tasteless purging salt, chemically termed (then *natron phosphoratum*, but now) "phosphate of soda," the bones were placed in iron cylindrical retorts, terminating at the farther extremity in a nozzle, to which were adapted pipes to receive and convey the gaseous and fluid products. The machinery and furnaces, in a word, closely resembled those now employed in the coal-gas works, and the bones were ignited to redness much in the same way as the coals. The liquids obtained were impure ammonia (hartshorn) contaminated by abundance of foetid animal oil. Here we perceive the union of the elements of water and of ammonia; the former being hydrogen and oxygen, the latter hydrogen and azote. A volume of carbon vapour must also have been extricated, and recombined with hydrogen and oxygen in the animal oil.

When these fluids had passed off, the bones or animal charcoal, then heated to redness, retained their figure, and, if suffered to cool in the retort, would have remained quite black, in the condition of *ivory black*. But the doors of the retort were immediately unluted, and the contents withdrawn as quickly as possible, when, by the attraction of oxygen from the open air, they burst into flame, and the carbon remaining in them was consumed, passing off in the state of carbonic acid gas.

Thus, then, the 51 parts per cent. were disposed of, leaving the 49 parts to be accounted for; but these represented the *inorganic* constituents of the bone.

It is now plain that by boiling and burning we get rid of the elements of humus and of ammonia; and, in so doing, relieve the bone from those substances which coat and entangle it, while they also prevent the operation of the soil and plant-roots upon those other elements which are required for specific purposes.

The *theory of humus* has, from the first, been problematical ; and while it was received as the sole interpreter of vegetable nutrition, philosophers and practical men floundered about amidst difficulties and contradictory perplexities. Carbonic acid was referred to as the *sine qua non*, and so long as any substance could be deposited in the land which might be made to yield that gas it was believed that enough was done.

The more recent discoveries have, however, proved that, while farm-yard manure contains an ample store of that decomposing animal and vegetable matter which is finally resolvable into black humus or vegetable mould, applicable to *every soil* and plant, there are other constituents of each individual plant which require specific manures for their especial nutriment. And now, to come to the point at once, if it can be clearly shewn by analysis that a sound well-grown turnip *does* contain bone-ash—that *trefoil* exhibits vestiges of gypsum—and that *lucerne* yields a very considerable portion of *phosphates*—then we can distinctly assert that, be the quantity of humus in the soil what it may, it is utterly incapable of furnishing one particle of those inorganic salts which, nevertheless, must be derived from the soil and not from the atmosphere.

Bones, deprived of their decomposable organic elements contain 49 parts per cent. of salts of lime. Now, in order to produce phosphoric acid from these salts, the bones, rendered white by their final combustion, were placed in deep leaden vessels ; and so much water was added as completely to cover them with an inch stratum in excess. Concentrated sulphuric acid was then poured with great caution over this water in a small stream, till, in the end, whatever was the weight of the bones, just one-half of that quantity of acid was superadded, while a man with a wooden oar stirred the contents of the vessel. The first operation of the acid was to seize the lime existing in the form of a carbonate—thus liberating, with strong effervescence, a volume of carbonic aerial acid.

In this process, 10 parts of the 49 were, by combining with their equivalent of sulphuric acid, converted into about 11 of sulphate of lime, in round numbers ; that is, supposing in every 100 parts of carbonate of lime there are 44 or 45 parts of carbonic acid. Artificial gypsum, therefore, was the first product of treating calcined bones with sulphuric acid.

The effervescence having ceased, the remainder of the sulphuric acid was employed in liberating the super-phosphate of lime, by combining with the basal lime of the bone-phosphate, and thus producing a proportionate additional quantity of artificial gypsum or sulphate of lime.

Let any one burn a few bones in a common furnace till they become white, and to one pound placed in a stone ware jar add one quart of rain water, and then about half-a-pound of the strongest sulphuric acid. By slow degrees, and in a few days, if the mixture be occasionally stirred with a stick, the decomposition will be completed, and a thick mass, called, by some writers, "gruel of bones," will be the result. If this mass be put into a jelly bag of coarse linen, a clear pale-yellow fluid will draw off, after which, water should be poured upon the filter till the fluid no longer has an acid taste. The filtrated liquid is the phosphoric acid of the bone, holding in solution a considerable portion of phosphate of lime, while the residuum in the bag is gypsum.

The agriculturist may thus learn what he effects by treating bones with sulphuric acid; for he will discover that he not only obtains a *super-phosphate* of great importance to any crop which contains, and therefore requires, this chemical agent as its peculiar element; but that, in addition, he has acquired a great bulk of that valuable salt called gypsum, (sulphate of lime.)

That the clear liquid is not pure phosphoric acid is readily shewn by heating it in an earthen vessel, and adding, till the hissing ceases, a quantity of carbonate of soda. A copious white sediment will be separated, and the clear liquid will be a weak solution of phosphate of soda, the salt originally announced as a purgative by Dr. Pearson. This liquid, evaporated by simmering, will form rhomboidal crystals of phosphate of soda.

I have thus endeavoured to shew in plain terms, without entering into any *atomic minutiae*, the precise composition of bones. As to the fact alluded to in the first quotation, that "the food of plants is *ready* prepared in bones that have been boiled, and that the roots will be found to have grasped the bones, and to pervade their cavities," it just amounts to, and proves nothing more than, the adhesive pertinacity with which the roots of any plant cleave to the bottom and sides of a porous garden pot. Here they find no prepared gelatine, nothing, in a word, but *diffused* water—moisture so distributed as neither to glut nor swamp the most delicate fibre; and, indeed, so long as the *porous medium* of baked clay can thus be retained in that state of saturation, most plants will thrive with superior luxuriance. As to manures soluble in soils, we know nothing of them; every direct experiment evinces that the rootlets, while uninjured, cannot inhale the smallest particle of even colouring matter, although it is equally proved that, by amputation, a woody twig will imbibe ink and red

solutions; and convey them even to the leaves and blossoms; water, therefore, alone, or holding salts in solution, (as soda, potassa, and the phosphates with a saline base, or gases developed by vital agency,) appears, upon the above-cited evidence, to be the only *terrene* aliment of vegetable bodies; since, moreover, it is certain that *humus* accumulates in all cultivated soils.

But recurring to undecomposed bones, whether crushed, ground to small pieces, or to the finest dust, they are so guarded by the animal matters as to resist the energy of either soil or plant, and, for a considerable period, that even of strong sulphuric acid. Yet they can be acted upon by that acid; for I have obtained phosphate of soda from crude bones. The speedy and determinate effect produced upon a crop of turnips, recorded by the Duke of Richmond and Mr. Pusey, depends upon the free condition of the *super-phosphate*. Admitting that it is not traceable in the turnip, while in that condition, it is not the less certain that, if chalk exists in the soil, the salt, which will be formed by its combination with the acid, will still be phosphate of lime, which, being a fresh product, and in an extremely divided state, can be attracted and taken up by the roots of the vegetables at the precise moment when it is immediately required.

Our colleges and seminaries, forming now or contemplated, for the instruction of rising agriculturists, ought to enter deeply into such researches, and make apparent those facts which, at present, are received as speculative theories.—*Quar. Jour. of Agriculture for March, 1845.*

HORTI-FLORICULTURAL NOTES.

(From the Horticultural Magazine for Oct. 1844 and Jan. 1845.)

The effects of Hybridizing on Flowers and Vegetables.—The application of this art to any really useful purpose is one of the most gratifying of all garden operations, and we have many instances of beneficial results. To this art do we owe some of the most splendid varieties of broccoli; varieties which, with a good deal of hardy character, possess all the beauty, and generally nearly all the flavour of a cauliflower; and there may yet be considerable improvement in the same race of plants. To accomplish these improvements, the hardiest species of the cabbage tribe should be inoculated or impregnated with the farina of the handsomest cauliflower, when nine-tenths of the produce may be thoroughly

worthless, but there may be an approximation to the cauliflower head with all the hardness of the parent plant. Season after season we may fail to do any good, but perseverance alone can succeed; for, if we gave up the point with one or two failures, there would end the matter; and because we had not, we should be assuming that we could not. For instance, suppose we actually fertilized the bloom of the hardy Savoy, which no frost can kill, with the farina of the cauliflower; the result might be an infinity of bastard-looking, rank, ugly-growing, and perhaps ugly-tasting, plants; yet there may be one or more, or some, varying a good deal, but having more or less a button of bloom close like the cauliflower itself, or sprouting like the Cape broccoli, or partaking of both; and this may prove hardy in constitution, tender to eat, and of free growth; it may be hardy enough to come in perfection early in the spring, or late in the winter, and easy to cultivate at any season, like the Savoy, or some of the earliest and hardiest cabbages. But whatever advance were made, with a very hardy plant for its parent, the chances are that something still better might be produced by again seeding it after fertilizing it again with the cauliflower. This is only a suppositious case; but all experiments are founded in some notion of their probable utility; and the subject which suggests this is the knowledge that, by saving seed from a thoroughly hardy plant, and fertilizing it with a tender one of peculiar qualities, there is every probability of the produce being hardy, and a chance that some may partake of the better qualities of the tender one.

To go from the useful to the ornamental, let us look at the American *Rhododendrons*, and those of Nepal and the eastern countries. *Rhododendron Arboreum* is of a bright scarlet crimson colour, very tender constitution, and very handsome. *R. Ponticum*, *R. Maximum*, *R. Cataubiense*, and others, are perfectly hardy, but not so handsome; in short, not one of them have any approach in their colour to a scarlet. Now, by fertilizing these hardy ones with the brilliant scarlet *Arborea*, abundance of varieties have been produced, quite hardy, with the magnificent colours of the tender ones. Thus have our varieties of hardy shrubs been added to most wonderfully, until there are almost as many shades of the *Rhododendron* as of any other flower. Another wonderful effect of this hybridizing may be seen in the grand addition made by Mr. Smith, of Norbiton, who succeeded in producing, by fertilizing a *Rhododendron* with the farina of the *Azalia Sinensis*, a beautiful yellow variety, a colour which all the *Rhododendrons* in the world never possessed before. This may be said to be the triumph of hybridization, because the *Azalia* is almost like another family, and there was hardly a

hope of producing bright yellow flowers on the foliage of a *Rhododendron* entertained by any but the indefatigable man who accomplished it; in fact, it is the flower of a deciduous plant upon an evergreen. That the flower made quite a sensation when it first appeared is quite natural; and it has prepared us for a hundred other novelties that we might otherwise have never thought of. With these proofs of the efficacy of hybridizing before our eyes, it does seem the height of folly to condemn it; yet professed botanists are said to have actually fought hardly against it on the ground of its destroying the distinctions of genera and species as laid down in botanical works. The art has not yet done much in the way of fruit. The raising of new varieties is not hybridizing: it is simply from sowing the seeds, which naturally produces various qualities and distinctions, for the most part wild, but with some improvements on the kind from which it is sown, and which have been found to be desirable; but we do not see why there should not be the flavour of the golden-pippin on the size of the Alexander, or the beauty of the Ferns-pippin with the flavour of a nonpareil. But whatever be the union proposed, there seems no obstacle to its accomplishment, by the ordinary means of hybridizing. As to its effect in flowers, nobody can even imagine a limit; and we are rapidly putting aside all the distinctions of species, and confounding many genera. Seedling varieties, the result of the art of hybridizing, are more numerous, and present many wider distinctions than were to be found between the species themselves, while the silly notions that these cross-bred subjects would not seed, has been universally exploded. Hybrids are found as perfect in all their organs, as free to seed, and the seeds as free to grow, as the most distinct genera in its native purity; and the plants produced from such seeds have proved as varied and as striking as the parent plant. It is not worth while to inquire here, whether, by crossing particular varieties of fruit, anything could be produced partaking of both, it is sufficient for us to notice generally what has been done. How much our gardens are indebted to the art of hybridizing for the larger portions of the floral beauties which now embellish them, and how much more is yet to be expected from the continuance of the practice, judiciously applied with a distinct object, and that object well chosen! In vegetables the great objects to achieve are hardness and earliness, alterations of colour, size, habit, shape; and in all cases the bad one, which is in some characteristic of what you want, should be fertilized by the good one, of whose qualities you wish the bad one to partake. Marshall was said to produce his beautiful prolific early bean by fertilizing the common horse-bean with one of the broad beans, and the result is

an excellent variety with many good qualities. Now, if there happened to be a very hardy pea, however coarse and bad, and ugly, it would be desirable to fertilize it with some of the best of the tender ones, and the result might be the quality of the good one on a plant with the hardy nature of the bad one, and so it would run through all vegetation. We seem mercifully permitted to use the fruits of the earth for our benefit; and the very means pointed out to us for perpetuating any new variety of plant, seems especially to direct us in the grateful task of improving all things intended for our use until they shall be all we require them to be.

Hybridizing.—In bringing before the notice of our readers the practice of hybridizing, we have to remind them that nothing should be done without a meaning as clear as the sun at noon-day; nothing should be attempted without an object, that object being the improvement of one or other of the flowers on which we are at work. Now, the only points to be gained by hybridizing, are first to obtain the properties or qualities of a tender plant, upon a hardy one, or the flowers or colours of an ill-habited plant upon one of good habit. Generally speaking, these two points comprise all that can be gained; but there may be another object, which is only comprised in those mentioned by implication—the mixture of colour between plants of equal, or nearly equal claims. The first of these objects is important, and has been accomplished to a great extent in the *Rhododendron*. The difficulties attending this operation with many flowers are, first, the species flowering at different seasons; secondly, their flowering in different places; for there are certain rules to be observed, without which failure is certain. The pistil of the female plant, or rather the plant which is to bear the seed, has to be impregnated with the pollen or farina of the male plant, or the one which is required to impart the desired property; and this requires some nicety. First, the seed-bearing plant must be watched, and as soon as the flowers open, the stamens, which hold the powder called pollen, must be taken out by small tweezers before they burst, indeed, as soon as they can be got hold off: this secures the pistil from being impregnated by the flower itself. The next is to observe from hour to hour, or from day to day, and as soon as the top of the pistil is glutinous, it is ready for the operation, and at that time the pollen must be applied: consequently provision must be made for it, by forcing or retarding the other plant, so that the pollen shall be ready at the time. One thing is certain, if the pollen be not ready, there is no hope; but if it be ready beforehand, it is possible to keep it. We have carried it a hundred miles, and kept it some days, yet it has answered; but how

long it could be kept has not been yet proved. It has been said that it could be carried a long voyage, and even then be efficacious. In the case of a *Rhododendron Maximum*, while being impregnated with a *R. Arboreum*, the latter was in bloom three weeks before the former; yet every stage of the process proved, as well as the result did, that the operation had perfectly succeeded. The plan we adopted was, to cut out the point or end of the pistil directly the flower opened, and as the pollen vessels burst we gathered the single flowers from the bunch, and placed the stalk in water in one of the holes of a pansy-stand, covering it with a wine glass, which completely excluded the air as we flooded the surface, that the edge might stand in water. This we did with each bloom as soon as the pollen appeared, so that, before one plant was ready to receive impregnation, we had all the flowers of the *Arborea* off the bunch some days. The flowers had almost perished, the farina had fallen to the bottoms of the cups, and we took it out with a camel's-hair pencil, and applied it to the pistils of the hardy plant, which had been accelerated all we could by protecting with glass. This merely proves that the pollen might be brought from great distances if done with care, and some persons speculate on its keeping as well as seed. This may be tried: our business is to tell what we know, and not to speculate on what may be done; but as opportunities of procuring flowers offer frequently, they need not be lost; and our opinion is, that flowers, picked in the usual way, and shut in a book, might be preserved some days in sufficient order to perform the operation. We have once in our lives seen rather a curious affair, in which a florist, something behind his neighbours in a flower which shall be nameless, sent to one who had made considerable advances, for a few flowers to inspect, and with these actually impregnated some of the best of his own, and made a rapid start in a season, much more so than he had made in half-a-dozen years previously. From this it may be gleaned, that when people send out choice flowers for inspection, they will have to deprive them of their pollen, or they stand a chance of making rivals almost before they are ready to send out their own plants. The mode of performing the operation having been described in part, we have merely to add, that some flowers are much more difficult to hybridize than others, and that unless they are caught at the moment the pistil is glutinous they will be crossed by some other flower, or by themselves. The instances of hybridization in various flowers will be recognised in many families, but in none more than the family we have mentioned; for in that the operation has been successfully performed by the bright yellow *Azalia Sinensis*, which is deciduous, upon the

Rhododendron, which is evergreen ; and here there is something worth trying for. The term has generally been applied to the crossing of species ; but the cross-breeding of flowers for the improvement of their properties is carried on to a great extent, as is evident from the Pansy, the Rose, the Mimulus, Phlox, Verbena, Pink, Carnation, Tulip, Auricula, Fuchsia, and many other subjects ; and those who will perform it, instead of leaving it to dame Nature, may, generally speaking, calculate upon a result with more certainty. The first object with a plant is to save seed from the best habit. With a flower, we should select the best form and texture ; and it is only when two flowers are distinguished for equal, though different, good qualities, that we can recommend both to be crossed ; for here the chances are that both will yield improvements ; but where the form of a flower, or the habit of a plant, is bad, and the mere colour or size is the object to obtain seed, only the plant of good habit, or the flower of good form and texture. In hybridizing or breeding the Pansy, seed from a round, thick, smooth flower. In Tulips, seed from a pure yellow, or pure white ground, with a thick, smooth, flat-ended petal, that forms the most even-edged cup, and the rounder the better. In a Rose, take the thick, well-imbricated petal, that opens freely. In a Verbena, take the roundest flower, the freest from notch or serrature, and the most stiff petal. In Petunias, seek for the thick round flower with the flattest lip. In Auriculas, look for the flattest, roundest flower, with the smoothest paste, the smallest tube, and the evenest divided colours ; for the widths of the white colour and edge ought to be alike. In the Ranunculus, which has been produced all but, if not quite, perfect, the semi-double varieties that are nearest to double, with bright, broad, thick, smooth petals, and let the pollen you apply come from flowers which are desirable on account of colour ; nor does it matter what flower it is, all that has to be done is to select that which is most desirable for form and texture as the seed-bearer, and that which is most conspicuous for colour or size. The Fuchsia Fulgens was the means of deteriorating the whole race of Fuchsias, and the benefit of crossing was hardly felt for years. The coarseness of all the novelties was proverbial, not because pains were taken to hybridize, but because Fulgens happened to be a free seeder, while the more elegant species were very shy seed-bearers, and florists merely sowed the seed from the former because it grew to their hands. Since this, people have been more careful, and the Fuchsia is rapidly improving. It is curious that the very seed-pods of flowers frequently change character ; those in the habit of coming small often come

large; and seeing these, we have a curious field for speculation in the adaptation of the principle to fruit. For instance, by impregnating fruit, for the purpose of observing whether there is any distinct alteration in the form or flavour of the produce the same year; not that it would indicate exactly the kind of fruit that the seed therein would produce, but that it might make a difference in the fruit, as it often does in the seed-pod. We know there is a difference produced in the seedling fruit that comes afterwards from the seed of the fruit impregnated; but of hybridizing in the case of fruit we shall speak hereafter, as well as of some flowers which present, from their nature, some obstacles to the operation.

Transplanting.—The whole art of transplanting consists in the removal of plants from one place to another and unless this be done without any material damage to the roots, the plant must suffer in health, and sometimes die altogether. Generally speaking, there is no difficulty in removing plants when young, and if they were removed every season they would hardly be the worse for it; when, however, we attempt to remove trees, plants, or shrubs, that have been many years undisturbed, the greatest care must be used to prevent injury from the loss of fibres, which, with all our attention, will be broken, and the plant must suffer in proportion to the damage done to the root. Two facts may be relied upon in the consideration of this subject; first, the growth of a tree is always in proportion to the under growth of its roots, and the head maintained grows as large as the roots will allow it; secondly, that any damage the roots sustain checks the growth of the tree or plant. From these two facts all the art of removing trees and plants should be learned, and upon these two facts all the art is founded. In transplanting seedlings of almost any kind, there is no difficulty, because the roots being easily removed whole, the plants suffer nothing. In seedlings of all kinds there is a strong disposition to make new roots, and, if the fibres are damaged, but little mischief accrues. It is when plants have stood some time, and their roots have made considerable progress, that the difficulty of removal begins to arise. Here, then, we have particular duties to perform; the first is, by carefully removing the earth to the very end of the root to get the plant up with as little damage as possible; and, secondly, to curtail the head sufficiently to allow for the damaged powers of the root. In taking up nursery plants, where despatch governs every thing, the roots lose considerably, and the ends of all the main spreading portions are invariably chopped off with the spade. This forces on us another operation: we have first to cut smooth all the bruised end, and, secondly,

to prune off a considerable portion of the branches, to diminish the evaporation and consumption of moisture; some trees, indeed, are so much inclined to grow and strike root, ~~that~~ they would live almost if the roots were chopped off; but there are others which are extremely impatient of damage at the roots, and, if not very carefully removed, will fail. Again, there are many trees that cannot be pruned; for instance, Cedars, Firs, Arborvitæ, and trees of that description, must not lose a branch, or they lose their beauty; hence the necessity of removing every fibre of the root with it, if the tree is to live; while the trees are small there is but little difficulty. But the more valuable kinds are generally kept in pots a few years, that they may suffer nothing by removal. As they advance in growth, the pots are changed; but at length they are turned out into the ground, and for one year, or even two, they might be moved well and easily, because their roots have not had time to spread; but, after that, the difficulty increases every year, and it is a tedious as well as troublesome job to follow out the direction of the roots, and extricate them from the ground, without damage. But certain it is that the only conditions required on removing a tree, of any age or kind, are these: First, to release all the root from the ground, without bruising; secondly, to remove the tree whole, as it is, and undamaged, from where it was to where it is to be; thirdly, to preserve all the fibres thoroughly moist, from the time it is released from the ground until it is replaced; fourthly, to support it in such way, on replanting, as that the earth may be all among the fibres and roots, solid and proper, as it was when it was moved; and, lastly, that in treading and pressing the earth about it, the fibres shall not be pressed together, nor the roots bent out of their places. These conditions attended to, and the largest tree in the world would remove well, and without suffering materially. Still, it is next to impossible to comply with all these conditions with very large trees, and therefore large trees are seldom removed, and rarely live after removal. Many contrivances have been resorted to; but there ought to be two years preparation before it is attempted. This preparation consists of digging a circle round the tree, and cutting off the roots that extend beyond this; and as even this may be too much check, if all done at once, it is necessary to do it at two different periods, by opening four opposite places, and at each place cutting away an eighth of the circle, building a wall within a foot of the remaining roots, and filling up that foot with the soil again, as well as the hole outside the bricks; new fibres and roots will spring out, and almost fill the space to the bricks. The

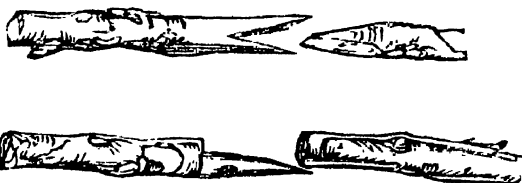
next season the other four spaces may be opened, and the roots cut off at the same distance. At this time there must be some undermining, to examine whether there be any roots running very deep or downwards, like a tap-root; and if there be any, they must be severed before you build walling to complete the circle of bricks. If these operations be well conducted, there will, by the next moving time, be a mass of roots within the brick wall capable of sustaining the tree; and the removal, without damage, will be accomplished with little risk. The only thing then required is power; for by clearing all round the outer part of the brick wall first, and then pulling it down, the roots will be undamaged, and the ball of earth entire. But too much importance is attached to the ball of earth in all cases: thousands of trees have been moved with balls of earth to them five times the weight of the trees themselves, while the roots have been dreadfully shortened all round, and the principal nourishing portions removed. In removing very large specimens, some nicety is required in reducing the head enough to make allowance for the decreased power of the roots, without injuring the general figure and appearance. Even in adopting the plan we have suggested, which is too troublesome for anything but a really valuable and large specimen, the head of the tree should lose something, and it will require some ingenuity to remove those portions whose removal will not injure the appearance of the specimen. But the same principles that govern us in the case of a large tree should be observed in transplanting all things. One certain fact is, that whatever the root suffers checks the tree, and unless the subject be the better for checking, the plant must be reduced, and therefore care must be taken to prevent the root from suffering. But many subjects are the better for the check; that is to say, they would be too luxuriant without such check; hence the practice of root-pruning, to check fruit-trees, a practice that hastens maturity and brings on fruit-bearing. This was the inducement to disroot pines, which some people have complained of as unnatural culture; but our fore-fathers were not such dolts as the present generation would have us think them to be. The old lesson read to us in our boyish days would apply to many theorists who undermine old practices, a truism not to be despised by any means, though not always right as applied to modern changes,—“Young folks *think* old folks are fools, but old folks *know* young folks to be fools.” The pruning of roots checks the flow of raw sap, which induces rank growth, and allows that already in the tree to elaborate and adapt itself to the

fruiting process; and if roots are not pruned, or a check given artificially, the tree must push on with vigour, forming leaves and branches, but no fruit, until the tree attains its mature size, and the roots have settled down the supply by lessening it sufficiently, when that sap which is supplied will properly elaborate, and fruit is the consequence. Confine the roots of a tree in a pot, and stunted growth is a certain consequence. Cut away the parts of a root which wander farthest, and a more sudden check takes place; yet it so lessens the quantity of nourishment taken up, that, presuming it be not too violent, it hastens the blooming and fruiting; carry this operation too far, and the check is too great; yet a little further, and the tree dies, because the leaves give off more moisture than can be taken up. The only chance, therefore, of saving trees of which the roots have been too much damaged, is to lessen the work which the roots have to perform, when the life will be saved. We have, in the clearing of a piece of ground, met with accidents, and destroyed more root than we ought, chiefly in consequence of some vigorous growths taking place out of the usual situation of roots; more than half has been destroyed perhaps. It has been on such occasions that we have tried experiments: plant such trees or shrubs as they come up, and they die; lessen the head a good deal, and they live, but are sickly; cut a very large portion down, and the remainder will not lose a leaf. Hence it is that plants of all kinds that are inclined to grow too vigorously receive a wholesome check when they are young. Hence it is that fruit-trees are root-pruned, and bear the earlier for it. Hence it is that pine-apples are disrooted to hasten their fruiting; and many plants that are apt to run away and grow too fast are frequently removed, and each time with the loss of some of their roots. But, on the subject of transplanting, it will be desirable to particularize many differently habited trees, shrubs, and vegetables, in papers devoted to themselves. It is enough to lay down, at present, as an unerring fact, that the loss of roots checks growth; that the only way to counteract this, when the check is not desirable, is to take extra pains to preserve them, to remember that every fibre that is broken is the loss of a means of support, and that, to maintain the plant healthy, it must be reduced in exactly the proportion that the root suffers; so that plants like firs, which cannot be cut down without the destruction of their symmetry, must not lose any portion of their roots, because there are no means of lessening the consumption, and therefore we must not lessen the supply.

Grafting.—This operation is of high importance in practical garden-

ing, for although hundreds of subjects can be raised from cuttings they cannot be rendered useful for years; while the same cutting grafted
* on a vigorous stock might form a tree the second year. The whole strength of the stock may be thrown into the small piece grafted on it, whereas if grown as a cutting it could not grow at all until it struck root, and even then but slowly for a considerable time. The advantages of grafting are not limited to this nor any other, but are many. First, it enables us to multiply any new or distinct variety to a much greater extent than by any other means, because a piece with a single bud on it is sufficient for a graft. Secondly, it enables us, if desirable, to throw greater or lesser nourishment or vigour into the graft according to the stock we place it on. Thirdly, it enables us to change the variety of any tree, or shrub, or plant already established, instead of removing the old tree or shrub and placing a new one in its stead. The manner in which the operation is performed is adapted to the circumstances under which it is undertaken: for instance, if grafting is performed for the purpose of multiplying a variety, stocks of the proper kind are selected, for the purpose of conveniently removing when the graft has taken; generally a year established in the ground if for fruit-trees, or a year old in pots. The first is because fruit-trees and shrubs in the open ground ought not to be more than three years in a place undisturbed; and therefore as one year after planting a stock is strong enough to be grafted, it allows of one year to let the graft grow, and a second to form a sort of head, or to grow into stuff, as the gardeners call it. These stocks may be grafted two or three ways: rapidly growing subjects, intended for standards, are grafted as near the ground as possible; some subjects are, however, grafted where they are to form the head: in either case the union of the graft or scion may be secured the same way, nor does it matter in what way the join is made. The most simple perhaps is, to cut the stock into the form of a wedge, and to split the scion, and cut the inside wood out so as to fit across it like a saddle; this must be done with a sharp knife, so that the bark may not be damaged by bruising. In placing the graft on the stock, if the wood be both of a size, or nearly so, the fit may be perfect; but if the graft, which is mostly the case, be smaller than the stock, it must be placed on one side, so that the bark of the graft or scion on that side shall exactly fit the bark of the stock, for if the scion does not reach half-way across the wedge of the stock, it will, nevertheless, soon cover it all, and even hide the join by its growth; whereas, if the scion were put on in the

middle of the stock, so that the barks would not touch, no union could take place. When the stock and scion are made to fit properly, they should be tied firmly together, and covered with proper grafting clay, thickly enough to keep out the air and prevent the wind from drying up the juices before they have time to unite. Another mode of joining these together, is to cut the top of the stock square, take a slice off the side, and then cut the scion or graft with a shoulder, and slope the inside so as to fit on the stock on the side where the slice was taken off. Here, too, the bark must be made to meet on one side, for it will unquestionably fail, unless the barks are made to meet all along one edge. Here the tying and covering with clay must be observed, the same as in the other case, and the diagrams show the way in which the cuts are made. Besides these modes of joining there are many others: one mode is to cut the end of the stock into a long slope, and the graft or scion into a similar sloping form; these two slopes being made to fit, it only remains to cut a slit in each slope in such position that the tongues formed by the cuts will tuck into one another, and bring the slopes together with a good splice: this tied and clayed as before mentioned, will secure a good union. To sum up the various modes of grafting, it matters not how the join is formed so that it be neatly fitted, the two firmly tied, and the air well kept out by the clay. Supposing this to be joined near the ground, the graft must be watched, and only the strongest bud be allowed to grow up: this should be encouraged to grow straight until it is tall enough for the trunk of a standard. All this time, the side or lateral shoots must be removed, except the top four or five, and as new ones come at the top the bottom



ones are to be removed, so that there shall not be more than the half-dozen branches when the trunk shall have attained the height it is intended to be; these half-dozen shoots are then allowed to form the head; of which, however, we shall speak at a future time, when, after

mentioning the various modes of grafting, we give lists of the best stocks on which to graft all the leading subjects.

The raising of Plants from Seed.—Nothing so completely kills the germ in a seed as alternations of wet and dry. It matters very little about the cause why these alternations kill them, but having proved it many times, I hesitate not to say such is the effect. Next to this in point of mischief, is cold and wet; and next to that, heat and dry. From repeated trials, I have proved that heat and moisture will cause seed of all kinds to germinate; but there are many that will grow with so little of either, as to require no care or attention. Among our popular plants, *Eriostemon buxifolium*, which gives a hard seed, and *Andromeda floribunda*, the seed of which is very small, are as difficult as any; but if there is a fair degree of moisture kept up, and the heat of an ordinary stove preserved, these seeds will germinate freely. The easiest mode of securing this, is to sow in a seed-pan of peat and loam, with a little sand; water with a very small-rosed syringe, throwing the wet like a moist dew, and as lightly, and covering with moss. In a fortnight, or rather more in some cases, and in others a month, the seed will germinate, when they must be shaded with white thin cloth or paper over a hand-glass or bell-glass, which should be placed on to protect it from draughts and alternations of atmosphere. As soon as they are large enough to conveniently get hold of, plant them out in similar pans, or large pots, an inch apart, water them gently from time to time, and cover again with hand-glass, and have it lightly shaded until the roots get established. In this pan they may grow until they have not room enough, giving them warmth no longer than establishes the roots, and then moving them into the green-house; keeping them, however, protected with the glass and shade, as before. When they require repotting, it is still better to get other pans or large pots, and increase the distance apart, for the larger the body of mould they are in, the better. In the case of Americans and hardy things, they may be bedded out in a place composed of peat and loam, such as *Rhododendrons* and *Azalias* are grown in the first June, after they are large enough, and there shaded from the heat of the sun daily; while the *Eriostemon*, or any other green-house plants, may be potted into those of forty-eight to the cast. The after management, however, is not so much the object of this paper, as the germination of the seed. We have known sowing after sowing to fail, in the hands of some of our best cultivators, but on trying the moss and heat, they have succeeded completely. When once the seeds have fairly begun to grow, it does not matter how soon the heat is reduced a little; for both

the plants we have mentioned, and all Botany Bay plants, *Ericas*, *Epacris*, and *Americana*, are impatient of warmth; and an hour or two neglected, would perhaps kill them all; still moisture prevents generally any rapid dissolution. It must also be remembered that an hour or two's hot sun would clear off and dry up the whole batch, in its young state. On this account, as soon after the pricking out as they are fairly established, and begin to grow, you may begin to lessen the heat; first by putting them in the coolest part of the stove, and next by removing them to the warmest part of the green-house, after which to the coolest.

Steeping Seeds.—It appears almost incredible that the merely steeping of seeds should have any prolonged effect on the plant itself, yet the evidence is so strong, if credence can be given to the proceedings of public institutions, that it were idle to dispute the fact; nevertheless, evidence of experiments should be received with caution. That a good deal more has been attributed to steeping than ought to have been is certain, and that many whimsical nostrums have been put in requisition is also obvious. The best authenticated is perhaps the effect caused by steeping in muriate of ammonia, and we think that as the fertilizing effects of so small a quantity as half an ounce in a gallon of water, and that used only once in six waterings, are proved, it is not too much to suppose that the steeping of a seed which would imbibe a considerable portion, may assist the future vegetation.

Seeds of Dahlias and other double syngenesious Flowers.—In saving seeds for sowing, never take them in the centre; take none but petal seeds, for they will give the largest proportion of double flowers. China Asters and Dahlias have generally some disk seeds, if they are even very double; therefore on taking the pod to get out the grains, begin from the outside, and when you have got a few of the rows of seed from them, throw the rest into a common sort, which you may give away or sell; but building upon the chances of good flowers, you will be much better paid for your labour by the few outside seeds, than ever you can by sowing the whole. This is worth attention.

Advice to Dahlia Growers.—When crops have been grown time after time from the same seed, each crop gets weaker; experience teaches that Dahlias are not different in this respect from potatoes. Whoever dreams of planting his own seed potatoes, as men do their own Dahlias, twenty seasons running? Nobody. Then Dahlia growers, take the hint, change a root of all your collections that do not do well with you, because they require a change as much as a potato. The great blunder that you have all made, is that of throwing away sorts which you call worn out,

only because they are tired of your stuff, and your treatment. Dahlias no more get worn out than any other plant, but you treat them worse than you treat any other plant. Hundreds of old Dahlias have been thrown away, that if now produced would win seedling prizes. Let us have no more such neglect, for it deserves bad flowers.

The Verbena.—This plant is rapidly coming into notice, not less for its use in the garden clumps than its appearance in vases and pots. The colours are more than ever diversified, and each season adds brilliance and beauty to collections. Some persons are checking the advance, by selecting bad instead of good ones from seedlings. We have seen some of the new varieties approaching the standard pretty well, though there is much to do yet; but the colour of a new sort captivates many growers sufficiently to prevent raisers from doing as they would. Those, however, who wish to advance the flower should never select narrow petals nor notched ones, for neither can be good, and the presence of them in a collection would spoil the seed. In choosing any for the garden, fix upon such as are very broad in the petals, in preference to any other quality, and when you have done this in each colour you will have laid the foundation of a collection; but if they are for the flower-garden alone, you have a second point to look for—you must have them dwarf, for a tall straggling Verbena is good for nothing.—*T.*

Cabbages.—Nothing is more common than making about two sowings do all that is required of this universally approved and useful vegetable, and they are kept stunted in the seed-bed (or perhaps run to seed there) for the purpose of taking plants out whenever there is a place to fill up. Now I opine that no vegetable is better worth the trouble of growing well than a cabbage; and for this purpose I recommend, as I practise, the sowing frequently, that the plants may be taken at their proper stages of growth for planting out to cabbage. By frequent sowing, that is to say, once a month during the growing season, and by pricking out into nursery beds as soon as the plant is large enough to handle, you can always contrive to keep plants that will answer the purpose of a short or prolonged growth. The advantage may be felt another way: there is no complete failure, no quarter of the ground need be idle six weeks, because you are always ready to fill it with this excellent vegetable. As to the sorts I am almost indifferent; I have planted for years only two sorts—the true early York and the Imperial—both are excellent, and if taken in season I do not know which is the better of the two.

ON THE ROTATION OF CROPS, AND ON THE QUANTITY OF INORGANIC MATTERS
ABSTRACTED FROM THE SOIL BY VARIOUS PLANTS UNDER DIFFERENT
CIRCUMSTANCES.

Royal Society.

May 22nd, 1845. "Memoir on the Rotation of Crops, and on the Quantity of Inorganic Matters abstracted from the Soil by various plants under different circumstances." By Professor Daubeny, M.D., F.R.S.

The author was first led to undertake the researches of which an account is given in the present memoir, by the expectation of verifying the theory of DeCandolle, in which the deterioration experienced by most crops on their repetition was attributed to the deleterious influence of their root-excretions. For this purpose he set apart, ten years ago, a number of plots of ground in the Botanic Garden at Oxford, uniform as to quality and richness, one-half of which was planted each year, up to the present time, with the same species of crop, and the other half with the same kinds, succeeding each other in such a manner that no one plot should receive the same crop twice during the time of the continuance of the experiments, or at least not within a short period of one another. The difference in the produce obtained in the two crops, under these circumstances, would, the author conceived, represent the degree of influence ascribable to the root-excretions.

The results obtained during the first few years from these experiments, as well as from the researches which had, in the mean time, been communicated to the world by M. Braconnot and others on the same subject, led him in a great measure to abandon this theory, and to seek for some other mode of explaining the falling-off of crops on repetition. In order to clear up the matter, he determined to ascertain, for a series of years, not only the amount of crop which would be obtained from each of the plants tried under these two systems, but also the quantity of inorganic matters extracted in each case from the soil, and the chemical constitution of the latter, which had furnished these ingredients. The chemical examination of the crops, however, on account of the labour it involved, was confined to six out of the number of the plants cultivated; and of these three samples were analysed, the first being the permanent one, viz. that cultivated for nine or ten successive years in the same plot of ground; the second, the shifting one, obtained from a plot which had borne different crops in the preceding years; the third, the standard, derived from a sample

of average quality, grown under natural circumstances, either in the Botanic Garden itself, or in the neighbourhood of Oxford. These analyses were performed by Mr. Way.

The examination of the soils was carried on in two ways; the first, with the view of estimating the entire amount of their available ingredients; and the second, with that of ascertaining the quantity in a state to be taken up at once by plants, the available ingredients being those which are soluble in muriatic acid; the active ones, those which are taken up by water impregnated with carbonic acid gas. This portion of the investigation was conducted in part by the author, and in part by Mr. Way, and has reference to three subjects; first, to the amount of produce obtained from the deficient crops; secondly, to their chemical constitution; and thirdly, to the nature of the soil in which the crops were severally grown.

The plants experimented upon were spurge, potatoes, barley, turnips, hemp, flax, beans, tobacco, poppies, buckwheat, clover, oats, beet, mint, endive, and parsley. The only crop which seemed to show the influence of root-excretions was *Euphorbia Lathyris*, which would not grow in the same ground three years successively, although the soil was found afterwards fitted for rearing several other species of plants. In the remaining cases, there was in general a marked difference between the permanent and the shifting crop, to the disadvantage of the former; and where exceptions occurred to this rule, they seemed capable of being accounted for by accidental causes. The amount of each year's crop is given in a tabular form, and their differences illustrated by diagrams showing the relation between the two crops of each vegetable.

The second part of the memoir commences with an account of the method of analysis, pursued by the author for determining the nature and proportions of the ingredients, present in the ashes of the crops submitted to examination. This method was, in general, similar to that recommended by Will and Fresenius in their paper published in the 'Philosophical Magazine,' No. 169; but in determining the amount of phosphoric acid, the following mode was adopted in preference to the one therein given.

As the phosphoric acid would seize upon the iron in preference to any other base, the amount of peroxide of iron present in the ash was first determined by precipitating it from a muriatic solution by means of acetate of ammonia. The weight of the precipitate gives that of phosphate of iron, from which that of the peroxide of iron may be readily calculated. This being ascertained, he proceeds to determine the phosphoric acid by operating on a fresh portion of the solution of

the ash, into which a certain known weight of iron dissolved in muriatic acid is introduced, in quantity more than sufficient to unite with the whole of the phosphoric acid present. This done, acetate of ammonia is added and the mixture boiled, when all the peroxide of iron, whether combined with phosphoric acid or not, is thrown down. From the weight of the precipitate, that of the phosphoric acid present may be calculated, as both the amount of peroxide of iron present in the ash, and that which was added subsequently, are known.

A report is then given of the analysis of the ashes of barley, of the tubers of potatoes, of the bulbs of turnips, of hemp, of flax, and of beans, all cultivated in the Botanic Garden; and from the data thus obtained, the quantity of inorganic matters abstracted from the soil in ten years by the above crops is deduced; and a table is given showing the relation between the permanent and shifting crops, with respect to their produce, the amount of inorganic matters, that of alkali, and that of phosphates, contained in them.

In the third part of his paper, the author considers the chemical composition of the soil in which the above-mentioned crops were grown. He states, in the first place, the method he adopted for determining the amount of phosphoric acid present in the soil.

An analysis is then given of the soil taken from a portion of the garden contiguous to that in which the experiments were carried on, and from one of the plots of the garden itself, and from these data a calculation is made, that the ground at present contains enough phosphoric acid for nineteen crops of barley of the same amount as the average of those of the permanent crops, and of the same quality as that obtained in 1844. It was also found, that there was a supply of potash sufficient for fifteen crops of barley; of soda, for forty-five; and of magnesia, for thirty-four. When, however, we examine how much of these ingredients is taken up by water containing carbonic acid, the proportion of each is found to be much smaller; and a striking difference exists, in this respect, between the soil which had been recently manured and that which had been drawn upon by a succession of crops. In the first case, the quantity of alkaline sulphate obtained in the pound was 3.4 grs.; in the latter it varied from 0.7 to 0.07; and of phosphate, the quantity in the former was about 0.3, whilst in the latter it varied from 0.18 to 0.05.

From these facts the author concludes, first, that the falling-off of a crop after repetition depends, in some degree, on the less ready supply of certain of the inorganic ingredients which it requires for its constitution; but that two crops equally well supplied by the soil with

these ingredients may take up different quantities of them, according as their own development is more or less favoured by the presence of organic matter in the soil in a state of decomposition.

Secondly, that it is very possible that a field may be unproductive, although possessing abundance of all the ingredients required by the crop, owing to their not being in a sufficiently soluble form, and therefore not directly available for the purposes of vegetation; so that, in such a case, the agriculturist has his choice of three methods; the first, that of imparting to the soil, by the aid of manure, a sufficient quantity of these ingredients in a state to be immediately taken up; the second, that of waiting until the action of decomposing agents disengages a fresh portion of those ingredients from the soil (as by letting the land remain fallow); and the third, that of accelerating this decomposing by mechanical and chemical means.

Thirdly, that it is probable that in most districts a sufficient supply of phosphoric acid and of alkali for the purposes of agriculture lies locked up within the bowels of the earth, which might be set at liberty and rendered available by the application of the artificial means above alluded to.

Fourthly, that the aim of nature seems to be to bring into this soluble, and therefore available condition, these inorganic substances by animal and vegetable decomposition, and therefore that we are counteracting her beneficial efforts when we waste the products of this decomposition by a want of due care in the preservation of the various excrementitious matters at our disposal.

Fifthly, that although we cannot deny that plants possess the power of substituting certain mineral ingredients for others, yet that the limits of this faculty are still imperfectly known, and the degree in which their healthy condition is affected by the change is still a matter for further investigation.

Lastly, that the composition of various plants as given in this paper, differs so widely from that reported by Sprengel and others, that we are supplied with an additional argument in favour of the importance of having the subject of ash-analysis taken up by a public body, such as the Royal Agricultural Society of England, possessed of competent means and facilities for deciding between the conflicting authorities, and supplying us with a more secure basis for future calculations. (*Chemical Gazette*, July, 1845.)

TRANSMISSION OF CUTTINGS TO INDIA.

It will be recollected that when suggesting a particular mode of preparing and packing cuttings of fruit-trees for India* (see p. 539, 1843), I said, in a fit of enthusiasm, that they might be so prepared and packed as to enable them to survive a sailing voyage to India round the Cape of Good Hope; but the experiment appeared so impracticable, that after preparing a quantity of cuttings in the way recommended, I could meet with only one gentleman who would incur the trouble and expense of transmission. The cuttings were gathered nearly three months before the vessel sailed, and after a voyage of nearly four months to Calcutta, it will be seen by the following report that 36 out of 82 cuttings had retained some traces of vitality. Now, if these cuttings had been sent by the Overland Mail in November, packed in the same manner, they would have arrived at Bombay in a fresh state, fit for grafting; and even had they been shipped from thence to Calcutta, the whole passage would not have exceeded half the time that they occupied round the Cape of Good Hope, to say nothing of the disadvantage of being cut three months before they were despatched. In future there need be no such delays, as the Peninsular and Oriental Steam-ship Company have concluded arrangements for running their vessels direct to Calcutta by the Red Sea route, and, by a rough calculation, I imagine that young fruit-trees may be sent by this conveyance from London to Calcutta, at a rate not exceeding 2s. each. In order to go so cheap, they must, however, be prepared in the nursery, after the following manner:—Graft strong shoots quite close to the ground, on stocks about the same size as that of the scions, and allow only one shoot to grow from the graft; about the end of August cut back this shoot to half its length, in order to strengthen the eyes below, and by the end of October the grafted tree will be fit for the journey; but a plant two years old would, however, be preferable. Before they are packed, all the small roots, that would be likely to perish on the way, may be cut off, and the grafted part reduced to 10 or 12 inches. Young trees, thus prepared, would occupy little space—not much more than what double the quantity of grafts would require. Dry sawdust seems the best article in which to pack them, and as stone fruit is more liable to injuries than Apples and Pears, they might be first packed in tin cases, and then put into strong wooden boxes, suffi-

* For this particular mode of packing, See Vol. 2, page 387, of the *Journal*.—*Eds.*

ciently large to receive 3 inches of sawdust all round the tin cases. I have known collections of seeds, packed in this way, to come safely from Australia, dry earth being used in place of the sawdust.

The following is a list of cuttings sent to Calcutta early in 1844, and the result :—

			Dead.	Alive.	
12 Currants,	8	4	} with a little sap.
	APPLES.				
7 Hawthornden,	5	2	} These cuttings were carefully coated in bees'-wax, and packed in sawdust in a strong box, which was screwed down very tight, in order to exclude air. They were shipped from London in the month of January, 1844, and arrived in June following at Calcutta.
6 Alfriston Pippin,	..	..	4	2
2 King of the Pippins,	..	..	0	2
3 Reinette du Canada,	..	..	1	2
2 Wormaley Pippin,	..	..	1	1
3 Downton Pippin,	..	..	2	4
3 Dutch Mignonne,	..	..	0	2
2 Brabant Bellefleur,	..	..	0	2
2 Pennington's Seedling,	..	..	2	0
	PEARS.				
2 Aston town,	..	..	2	0
8 Ne Plus Ultra,	..	..	2	6
3 Althorp Crassane,	..	..	1	2
3 Easter Beurré,	..	..	0	3
3 Beurré Bosc,	..	..	0	3
2 Beurré Bance,	..	..	0	2
3 Hacon's Incomparable,	..	..	2	1
	PLUMS.				
10 Greengage,	..	..	10	0
82 Cuttings,	..	..	46	36

Other cuttings had their ends inserted in Potatoes, without any bees'-wax, but they all perished.—*D. Beaton, Gardener's Chronicle, August 1845.*

Correspondence and Selections.

NOTE ON THE KANG PUNNEAH NAGA TRIBE.

By J. M'CLELLAND, Esq.

At page 6, of the sketch of the late Mr. Griffith, published in the *Journal of the Agri-Horticultural Society*, (Part I., Vol. IV.) it is remarked, in allusion to the privations to which he exposed himself, that he had frequently to construct his own shelter for the night, &c. ; and in a note, in which an instance of this is given, page 36, it is said, he was then twenty miles beyond the British boundary, and amongst a tribe only known by their depredations on the outposts of the Assam Light Infantry, occasionally decapitating whole guards as they lay asleep.

At the moment of writing the above note, the discipline or respective merits of particular troops or corps did not occur to me, and I mentioned the Assam Light Infantry quite inadvertently.

I find on reference to a *Journal* kept on the occasion, that instead of the Assam Light Infantry, I ought to have said the Rajah's troops, as I find the district along the Naga frontier was at the period in question in possession of a native chief, Rajah Parunder Singh. With regard to the distance beyond the boundary at which the incident alluded to occurred, the Naga boundary was formed by a bund, two miles on the Assam side of Gabru Porbut at the time of our visit, and the point to which Mr. Griffith advanced on the occasion, was one day's journey beyond Gabru ; so that I set down twenty miles beyond the British boundary as a mere guess. Capt. Hannay, who appears to have taken umbrage at the allusion made inadvertently to the Assam Light Infantry, asks where the Tea Deputation, to which Mr. Griffith was attached, could have crossed the British boundary to such a distance. I may remark, however, that

the Deputation may be said to have broken up on the 3th of March, the day before we set out on the excursion in question.

We returned to Gabru from the Naga hills on the 12th of March, and reached Joorhath on the 15th, when we find the following entry in our Journal, which bears out our remark on the character of the Nagas. "15th (March 1836). After a second interview with Mr. R. Bruce, in the Rajah's service, the only person on the spot we had to consult, we have abandoned our intention of visiting the Dhunsiri at this advanced season, particularly as it would take several days to get there, and several more to get boats. The Nagas, it would seem from Mr. Bruce's account, are a people with whom the intercourse of individuals should be carefully extended, and they are not now in a settled state, so as to render it prudent to enter the hills unless with a guard. There are three or four distinct tribes of Nagas on the Rajah's frontier, which the official situation of Mr. Bruce, as Captain in command of the Rajah's Military force, consisting of 600 men, renders him well acquainted with.

"They are, he informs us, warlike tribes of the most uncivilized nature. The houses of their men of rank, and indeed of all classes in proportion to the means and opportunities they may have had, are but museums of human skulls, procured during their wars amongst themselves, as well as with their neighbours. It is the highest honor a warrior can boast, to have in his possession the skulls of the greatest number of victims to his spear. The head of a female, is however, so highly prized, that the Naga who procures one from an enemy is *tatoed*, and henceforth worshipped as a deity during life, and has a stone raised to his memory when he dies.

"Their practice is to fling the spear, which they do with great precision, and when struck they rush upon their victim, and by means of the Dhau they carry behind in their girdle, strike off the head with incredible dexterity. Mr. Bruce further informed us, that about a year or fifteen months before, twelve of the Rajah's sepoys on outpost duty, were decapitated in this way before they had time to turn out. The Nagas, Mr. Bruce says, are remarkable for their successes in night attacks. They conceal themselves for days as close as possible to the place they intend to carry, requiring nothing for their support but a little raw grain; and on a suitable occasion,

they rush from their concealment, piercing every object before them with their spears." The above details are given precisely as they were related by Mr. R. Bruce, although we saw nothing in our intercourse with the Nagas to indicate the character given of them. Yet there was nothing in the statement materially different from what appeared to be the general impression at the time in Assam; and had Captain Hannay written to me, instead of appealing, as he did to the Agricultural Society, relative to an obvious inadvertence in the sketch of his late friend, all I can say is, that he would have saved himself and the Society some trouble. It is true the Secretary was considerate enough to refer the substance of his first letter to me, but coming before me in that way, the nature of the inadvertence did not occur to me.

Having had the subject thus recalled to my recollection, I at first intended to draw up a short notice of what we saw of the Naga tribe on the occasion adverted to, and had a drawing lithographed from our sketch book for the purpose. But recollecting that they have since been visited by numerous officers from Assam, our own observations would be of comparatively little interest.

I may remark however, that it is probable there are at least two distinct races occupying the extensive mountain tract between Cachar valley and Assam, known under the common name of Nagas. Mr. Griffith in his subsequent travels, now under publication, describes the Nagas met with 150 miles to the N.N.E. of those we first saw, as of Tartar origin, having like the Singphos and Burmese the Chinese cast of features; while the *Kang Punneah* tribe, or those inhabiting the hills near Gabru Purbut, were regular Bengalese both in complexion and physiognomy, retaining the stature and figure of the original stock, under a very different climate and mode of existence. It has often occurred to me, that the history of the various tribes inhabiting the mountain ranges between Bengal and Assam, would, if properly investigated, supply some curious information, being the boundary at which two great families of mankind meet. Without blending with each other as might be expected, they exist rather in little isolated colonies, preserving all the peculiarities of their respective stocks. Thus the Khasias and the Garrows are of Tartar origin, occupying the extreme limit of the range, though surrounded by Georgian nations. The Nagas who occupy the central districts of

the same chain, are (if we may judge from the few we saw) Georgian races, though bounded on the east and west by Tartar nations, such as Kassias, Singphos and Burmese and eastern Nagas. With regard to the drawing of one of the Naga tribe we visited in 1836, the copyist has not preserved the lines of the features, which are too soft, so as to give the individual a boyish appearance, instead of which he was a man of 28 or 30 years of age. Notwithstanding all the civilities we offered, he was the only individual who ventured to hold any direct intercourse with us. His visits were rather capricious and uncertain; they were however quite disinterested, for with the exception of tobacco for immediate use, and a few glass beads, he seemed quite indifferent to any thing we had to offer. The only covering of the men consists of a small square piece of thick cloth fixed in front to a narrow girdle, and ornamented with courie shells in the manner represented in the drawing. Their arms consist of a light spear, and a peculiar straight heavy knife, intermediate between the Singpho *Dhaw* and Goorka *Coukrie*, which they carry behind in the girdle. We saw no women.

J. M'CLELLAND.

29th November, 1845.

Result of Experiments with Guano on Flowers. By R. SMITH, Esq.

To the Secretary to the Agricultural Society of India.

SIR,—In the early part of the present year, I obtained from the Agricultural Society a small packet of Guano, weighing about two pounds.*

The Guano appeared to be mixed with earthy deposit, and presented the appearance of a reddish brown, or ferruginous powder, of a coarse consistence, and possessed that peculiar "Sea bird" smell, for which no corresponding term seems hitherto to have been invented.

From what I had heard and read of Guano as an article of commerce, the sample which I had received appeared to me to differ, in color at least, from that which is known in Europe; most probably from some peculiarity in the soil of the place whence it was obtained.

* This Guano (Peruvian) was portion of a supply presented by W. P. Grant, Esq.—Eds.

Be that as it may, I proceeded to give it such trial as the means which I possessed, afforded ; and perhaps my experience in this way may be of some service ; since I concluded, that the majority of the experiments would be made on vegetables. I therefore chose flower seeds, flowers and shrubs, for the purpose ; and the results of my experiments were as follows.

I purchased from an Auction firm in this place, a packet of French flower seeds, consisting of most of the ordinary and some superior sorts of annuals. As the experiments were intended to determine the fertilizing property of the Guano, I selected an ordinary but good soil for the purpose, but to which no other preparation was given than by sifting to separate ~~extraneous~~ matters. In this soil the seeds were sown, in small gumlahs ; on the surface of each, about a tea-spoonful of the Guano was strewn, and lightly mixed in, in order that, if the Guano possessed a stimulating power on the germination of seeds, such effect might be shewn by this method of making the experiment.

The seeds to all appearance were in excellent condition when sown in gumlahs, and no water was given to them, and then sparingly, merely by means of sprinkling, until the third day after they had been sown. At the same time, care was taken to shade the gumlahs for a few hours during the heat of the day, and precautions were used, at the same time, against insects.

I am thus particular in mentioning these apparently trivial circumstances, because, I am convinced that, in instituting experiments of this nature, one cannot take too much pains, considering the importance of the results involved.

I waited very patiently the usual time for the germination of the seeds ; but to no purpose. Not one came up : still, I was loath to suppose that, an experiment so carefully undertaken, had failed so evidently, and I continued for some time longer to entertain the hope that the seeds would vegetate ; but, after the lapse of nearly a month, I felt that the case was hopeless, and returned the contents of the gumlahs to the spot whence they had been derived.

And now comes the consideration—was the fault in the Guano, or in the seeds ? As in many more weighty cases, much might be said on both sides ; but, as the dose which I had given to each gumlah was exceedingly small, I must give a verdict against the seeds, which,

despite of their excellent appearance, most probably had lost their germinating powers, the blame of which may rest with the party who offered them for sale.

I had calculated so certainly on the seeds vegetating, that the whole had been sown at once without any reservation, which I regret; as, had a portion been reserved, it is probable that the question whether they or the Guano was in fault, would not have been left with a shade of doubt attached to it.

Disappointed in the result of the experiment in seeds, I next applied myself to the task of endeavouring to ascertain the effect of the Guano on flower plants; and in this, I may venture to say, that I experienced some degree of success. The Guano, generally in very small proportions, not in fact exceeding that of a tea-spoonful on an average, was strewed around the stems of flower plants in all stages of growth, both in the open ground and in pots, and carefully stirred in with the soil to the depth of an inch or two, and in some cases, quite superficially. The effects, after careful observation for some time, seemed to be that succulent plants grew more vigorously from the application of the Guano, and their leaves assumed a more healthy appearance where they had previously been in a state approaching to disease. On shrubby plants I do not think that any decided effect was produced; while on the species of *Juncæ*, the *Russelia* being a marked instance, the application of the Guano was evidently injurious.

From the effect of the Guano on succulent plants, I have reason to think that it will be found a valuable stimulant and nourisher for vegetable productions, and the cereal grains, which form the bulk of the products of the soil in practical agriculture. I am at present arranging for a series of experiments on the effects of artificial electricity on plants; and I hope in due course to present to the Society the results of the experiments. Small as these matters may appear in principle, they are the same as those by means of which Nature works out her stupendous effects; and should not be underrated either for their simplicity or for the inconclusiveness of their present result, for—as is well observed—it is the units of individual experience which go to compose the sum total of human knowledge.

Mily. Board Office,

8th Sept. 1845.

I remain, &c.

R. SMITH.

RECIPE FOR THE PREPARATION OF THE SALEP MISREE ROOT.

Extract of a Letter from Captain J. C. BROOKE, dated Kotrah vid Neemuch, August 12, 1845.

"I do not know whether you ever received the box of Salep Misree Roots I sent;* kindly inform me, as I never had an acknowledgment of their receipt. The way to prepare them is not, as stated by Royle. The Caubul plan, as told me by a native gentleman, (and who having learnt it from an Affghan merchant, prepared some of the roots I sent him as fine as the finest Caubul,) is as follows—'Cut the outer skin off with a knife, and all the dirty rotten parts very carefully. Throw the roots into milk and heat, taking care not to boil them, or to allow them to get very soft. Dry them in the shade a few days, and afterwards in the sun, till they become perfectly hard.' Take care to throw the milk away, as it is intensely acrid and poisonous. The reason for using milk, I conceive, is the fact of its not dissolving the glutinous part, while it extracts all the acrid vegetable juice. Water will do the latter, but it carries the giuten along with it. I sent some of the roots to Captain Hollings at Lucknow, and they have flourished. They require the richest rotten loam moisture, but good drainage: they may be kept out of the ground from January till May."

FURTHER EXPERIMENTS WITH THE SHAN BLACK VEGETABLE DYE, ETC.

Communicated by the Society of Arts.

To the Secretary Agri-Horticultural Society, Calcutta.

DEAR SIR,—At length I am enabled to inform you as to the proceedings taken by the Society of Arts in reference to the Vegetable Black Dye from the Shan country; the sample of the Cloth manufactured from the fibre of the Pine-apple and Moorva or Moorghie; and the Clay Bust of the late Dr. Carey, by Nubboo Coomar Paul.

The Committee of Chemistry, to whom the Black Dye was referred, considered the subject at their meetings of November 30th 1843,

* The box failed to reach the Society.—*Eds.*

February 29th 1844, January 23rd, April 8th, and May 12th 1845, respectively. The Black Dye has been subjected to experiment by Mr. A. Aikin, Mr. J. T. Cooper, and Mr. E. Solly, all chemists of considerable experience. By transmitting (as under) a copy of Mr. Cooper's statement made at the last meeting of the Chemical Committee of our Society, you will be enabled to judge to a certain extent of its value in a commercial point of view. Both Mr. Aikin and Mr. Solly have also furnished reports of the Dye, and the matter was adjourned till next session to enable Mr. Cooper (Messrs. Aikin and Cooper being at present chairmen of the Committee of Chemistry) and Mr. Warington the chemist, to subject the Dye to further experiments.

[Copy of Mr. Cooper's statement with regard to the Vegetable Black Dye.]

"Mr. Cooper produced four bottles, each containing a solution of the Dye, and gave the following evidence as to the results of the experiments made by him. Two of the bottles contain a solution of the Dye in lime water and green sulphate of iron, the other two are solutions in lime water and potash; they both make a perfectly colourless solution, both absorb oxygen; on exposure to the air they become clouded, but the potash has the greater power of holding the colour; there are 12 grains of colouring matter to 72 of lime, in each of the bottles. Like indigo it does not require any mordant to render it fixed; it seems to be a dye of itself: the two specimens of Dye are identical; both the solutions absorb oxygen rapidly, potash seems to be the proper solvent for it. I do not imagine that it is of any great value, as a dyeing Drug it wants power. With 12 grains of indigo you might make a very strong Dye, sufficient to dye half a dozen pocket handkerchiefs. The addition of a little acid would precipitate all the colouring matter; by dipping a piece of cotton into the solution two or three times, and then exposing it to the air it became a sort of slate colour. As an article of commerce, I do not imagine that it is of any value; there are so many substances already in use for dyeing Silk, black: as a curiosity it might be worth having."

2nd. With regard to the manufacture of Cloth from the fibre of the Pine-apple and Moorra, the whole of your communication, dated

14th May 1844, was read, and entered on the minutes; and I am desired to return to you, as the representative of the Agri-Horticultural Society of India, the best thanks of the Society of Arts for introducing the subject to their notice, and at the same time to inform you, that the samples are not considered by our Committee of Colonies and Trade sufficiently large to be tested either as Cloth or Rope. They will be glad to receive larger samples, if they can conveniently be sent.

3rd. In respect to the Clay Bust of the late Dr. Carey, my task is easy and very agreeable. I had the honor on the 2nd June last to receive from the hands of our illustrious President, Prince Albert, the Society's Silver Isis Medal, to be transmitted to Nubboo Coomar Paul for his performance. I shall be obliged to you to inform me how I may send it in the safest way to your "self-taught Native Sculptor."

I beg to return you the thanks of the Society for Nos. 1, 2, 3 and 4 of vol. III. of the Journal of the Agricultural and Horticultural Society of India.

Society of Arts, &c. Adelphi,

I am, &c.

London, July 1st, 1845.

FRANCIS WHISHAW.

CORRESPONDENCE REGARDING THE CULTIVATION OF MADDER IN THE
DECCAN, WITH HINTS ON A MODE OF CURING SENNA.

To JAMES HUME, ESQ., Honorary Secretary Agricultural Society of India.

MY DEAR SIR,—A short time ago I was favoured with a despatch of Madder seeds from you. Of these I have carefully sown a part, and distributed the rest in quarters where they are likely to be duly appreciated. I beg to offer, for the inspection of the Committee of the Society, a specimen of Madder raised by me, from seed received years ago from Mr. Little in Bombay, the former very active and useful Secretary of the Society. I have since then propagated the plant pretty extensively from cuttings, which root readily, or from separation of roots. It appears very hardy, and requires no care, but rather a good soil. It keeps down weeds by its inherent strength of growth, and I should think that in the rich alluvial of Bengal it would

answer well. I had repeatedly thrown aside, as comparatively useless the roots, which appeared to me to contain too little of the red colour, and the yellow seemed to predominate. I now however observe from the contents of the number of the Society's Transactions, which you have been kind enough to forward to me, that the yellow part of the Dye is chosen in England. We have in our higher hills here pretty common, the *Rubia cordifolia*,* a very hardy and useful species, but the roots appear to be turned to no account by the people.

I remain, &c.

ALEXANDER GIBSON,

Sooneri, 8th July, 1845.

Superintendent Botanical Gardens.

P. S.—I am happy to say, that I have many plants of Dr. Wallich's Sumach now flourishing here. I mean the Divi-divi, or American Sumach. I am just about to advertise a number as fit for distribution. The young plants appear very hardy, having shewed not the least sign of being affected by the very hot winds we had in April and May.

—•—

Report on the foregoing specimen of Madder.

I have carefully examined the Madder roots forwarded to me by you, but find that they have undergone no preparation whatever as to drying in the sun or a stove which naturally renders its appearance bad and dead, instead of being bright and lively.

The powder prepared from the root by you is a tolerably good "Mull" in appearance; but it would, I think, have borne more than the resemblance of "Ombro," had the roots been properly dried.

Notwithstanding this unfavourable report, I think there is some ground for hoping that, with proper care, a very good article might be produced, quite sufficiently so, at any rate, to warrant your Society in asking Dr. Gibson to make further experiments.

I shall be most happy to draw up a paper of the method which the article is commonly prepared in Holland, should the Society think it worth while giving it their attention.

Yours faithfully,

Calcutta, 10th Sept. 1845.

RICH. DODD.

* The Munjeet of commerce.

MY DEAR SIR,—I have now the pleasure to send you a small specimen of the Madder, dried more carefully than the last was. This may enable you to judge better as to its qualities.* It is at present not in seed, but I will take the first opportunity of its being so to send you a parcel.

Meantime I have planted out a good many roots; but this not being the season in which roots shoot with vigour, they have only been partially successful: however, in April or May, I hope to extend the cultivation considerably by this means. I feel much obliged by the interesting communication with which you favoured me. I was very sorry to learn that the consignment of seeds for Dr. Thompson at Sydney, never reached you. I will make up another parcel in the chance of getting an opportunity of sending it direct. I think that the rather dry climate of New South Wales, is likely to suit the Senna plant well. By the way, I ought to mention that increased experience has now taught me a better mode of curing the leaves. It is this—I now cut down the plant to about four inches, and have the leaflets *immediately* stripped off and dried. This quite does away the necessity for after stalk-picking, and gives a fine, entire, and well coloured leaf. I am free to confess, that for this improved process, I am indebted to some of the surrounding native cultivators, who have willingly taken up the culture, and bring their produce regularly to me to be purchased for the medical stores.

Believe me, &c.

Sooneri, 1st Nov. 1845.

ALEXANDER GIBSON.

* “ Having carefully examined the root of the Madder forwarded to the Society, I find it in every way far superior to the first specimen sent by Dr. Gibson, and on which I offered an opinion in September last. It is more brilliant in color and better dried. The preparation from it, owing to its having been made in the light, has the appearance of French Madder; but even in this state it is far superior to the preparation from the other specimen.” *Extract from a Report, dated 13th December, 1845.*

Capabilities of the climate, and natural features of the Palamow District for the rearing of Sheep. Communicated by C. B. TAYLOR, Esq.

MY DEAR SIR,—I have been for some time past endeavouring to rear a flock of Sheep, of a cross-breed between the Merino Ram and the white-fleeced Ewes of this country, and having got sixty lambs, a few of which are upwards of a year old, have unfortunately lost my Ram ; I regret this much, because there is every probability that better wool would, from a succession of crosses with the Ram and its offspring, be produced up here, than in the low sultry climate of Bengal. This is a hilly uncultivated country, and there is consequently abundance of pasturage. The climate being temperate for at least eight months in the year, and tolerably cold for four months, is better adapted for the production of fine wool ; generally, the thermometer at sunrise during the months of November and February, the commencement and end of what is called in India the cold season, stands at 40° Fahrenheit, and in December and January, it usually stands at from 34 to 40°, and I have observed that it frequently stands at 34°, I mean at sunrise, and it remains pleasantly cold from October to the middle of April, even at the latter period when the heat is so great in Bengal, I am obliged to cover myself with blankets at night. In looking over a memorandum book for 1843, I find that the thermometer stood at 53°, a little after sunrise on the 30th March, on the 30th of April at 78°, also a little after sunrise, and on the 10th and 11th of May, a little after sunrise, at 70°. This temperature, differing so much from Bengal, makes it probable that much finer wool would be produced up here ; but if I cannot get another Merino Ram or two, my experiments must be at an end, and therefore take the liberty of asking you, if you are acquainted with any gentlemen that would be likely to sell me one. Many of the members have been trying the experiment in Calcutta, I believe, but with what success I have not heard ; but were it in my power to procure the Rams from England, I would not confine my attempts to improve the fleece only, but would also endeavour to increase the weight and size of the carcass also, which I think could be more certainly accomplished than any permanent improvement in the fleece,

for I suspect were the fineness of the fleece not kept up by crosses with imported Merino Rams, it would soon degenerate. But I think success would be more certain in attempting to increase the size of our undersized Sheep, as well as the improvement in the breed rendered more permanent; for instance, a cross between the Tees Water Ram, the largest breed in England, and the offspring of a Merino Ram, or their offspring after a succession of crosses with the Merino Ram, would combine in itself not only a finer fleece, but a good weight of carcass, which would have the double advantage of yielding a greater weight of fleece;—but the obstacle in the way of all such experiments is the difficulty in procuring the required Rams. I know no one in Calcutta, who would undertake such a commission, but should be glad if any respectable party would undertake it for me, and pay the probable cost in advance.

Yours, &c.

Rajharra Colliery, Palamow,
14th Sept. 1845.

C. B. TAYLOR.

*Remarks on a few kinds of Edible Oils, and on the Butea Kino of the
Palamow Jungles. By C. B. TAYLOR, Esq.*

MY DEAR SIR,—I have the pleasure to inform you, that I have despatched to your address a box containing the following mentioned Oils, and which I promised you some time since.

Hingun,* *Mowah*, (*Bassia latifolia*,) *Cossum* tree,* *Cossum fol* or Safflower, Sun-flower, Poppy seed oil, Cotton seed oil, and oil of the Radish seed.

I think you will find the *Hingun* to be the purest of all these oils, and nearly equal, if not completely so, to Olive oil.

The *Mowah* oil I also consider a very valuable oil, and which possesses the property, like cocoanut oil, of “congealing at the ordinary temperature of the atmosphere” in the cold season, and could

* Since the despatch of these oils Mr. Taylor has forwarded a few of the leaves, fruit, &c., of the *Hingun* and *Ogsum* trees, and they have been recognized by Dr. Wallich to be respectively *Ximenia* *Aegyptiaca* and *Schleichera* *trijuga*.—Eds.

therefore I suppose be converted to the purpose of making Stearine, which is used in England for making soap and candles, for it was this quality of congealing I suppose, that suggested the idea of putting the oil "in the state of lard" into hair bags, and then subjecting them to a heavy pressure, the substance forcing itself through the bags being called Elaine, and what remained in them, Stearine. It was the latter substance, after being purified, was found to make candles of a very superior quality, and I can see no reason why the *Mowah* oil, being subjected to the same process, should not answer the same purpose; the latter oil would have the advantage of being much cheaper, for I think it could be sold in Calcutta for five or six rupees per bazar maund. It is applied up here by fraudulent people to the purpose of adulterating Ghee, and must be very difficult of detection, as the colour and odour are nearly the same; the oil has a bitter taste, but is eaten by the inhabitants of this district, who assert that the bitter taste goes off when cooked with their food, and also when it is five or six months old. The sample I send is newly made.

There are two other trees of this species in India; and as they appear to merit some attention, I beg to extract a short account of them from the *Penny Cyclopædia*. See article *Bassia*.

"*Bassia butyracea*, the Indian Butter tree, also the Fulwa, or Fulwara tree, is found wild on the Almora hills in India; where it grows to a considerable size, its trunk sometimes measuring fifty feet in height, and five or six feet in circumference. It has broad oval long-stalked leaves, from six to twelve inches long, smooth on their upper surface, hairy on their under. The flowers which are large and pale-yellow, hang down near the tips of the branches, from the axils of the leaves, and generally grow there together. They are succeeded by smooth pulpy fruits, about as large as a pigeon's egg, usually containing two or three roundish light-brown seeds. From these is produced a fat-like substance, which is a kind of vegetable butter, concerning which we find the following information in the *Asiatic Researches*, by Dr. Roxburgh. 'On opening the shell of the seed or nut, which is of a fine chestnut colour, smooth and brittle, the kernel appears of the size and shape of a blanched almond. The kernels are bruised on a smooth stone to the consistency of cream, or of a fine pulpy matter, which is then put into a cloth bag, with a

moderate weight laid on, and left to stand until the oil or fat is expressed, which becomes immediately of the consistency of hog's lard, and is of a delicate white colour; its uses are in medicine, being highly esteemed in rheumatism and contraction of the limbs. It is also much valued, and used by natives of rank with an *Utr* (aromatic oil) of some kind, except the fruit which is not much esteemed: no other part of the tree is used. After the oil has been expressed the dregs are employed by the poor as food. This Fulwara butter will keep many months in India without acquiring any bad colour, taste or smell, and might no doubt be substituted advantageously for animal butter. The timber is of no value, being nearly as light as that of Semul or cotton-tree (*Bombax heptaphyllum*.)'

"*Bassia longifolia*, the Indian oil tree, is a large tree, a good deal like the last; but its leaves are narrower, and its flowers much more fleshy. It is a native of the Peninsula of India, and is found in plantations along the Southern Coast of Coromandel, where it is called the Illupie tree; its fruit is yellowish, and yields by pressure a valuable oil, which is used by the poorer natives of India for their lamps, for soap, and instead of better oil for cookery. The flowers are also roasted, and eaten by the Indian peasants, or bruised and boiled to a jelly, and made into small balls, which are sold or exchanged for fish, rice, and various sorts of small grain; the wood is as hard and durable as teak, so that this is one of the most generally useful trees found on the Continent of India."

There are two oils which I now send, which I did not mention in my former letter on this subject; Radish and Sun-flower; these are enumerated among the edible oils in Loudon's Encyclopædia of Agriculture, although the former has got such a disagreeable smell that I suspect few would be found willing to eat it.

It must have been remarked by those who have been long in the country how rarely you see a plantation of useful trees, I mean those planted by the hand of man; I suppose, with the exception of some of the Palm species and fruit trees, a tree was never planted in India with a view to obtain a profit from it, although it is certain that there are many valuable trees indigenous to the country that might be formed into plantations, with a certainty of their yielding a handsome return for the capital expended on them. I also believe great

benefit would be derived from introducing some of the useful trees belonging to other tropical countries into this. At present, writing on the subject of oil, I shall mention oil trees or plants: the *Arachis* nut of the West Indies would undoubtedly prosper with us, and which I read somewhere lately, had been propagated in some part of the Madras Presidency. Another useful oil plant, a native of China, would also make a valuable addition to our stock of oil plants, and respecting which I beg to annex an extract from the Library of Entertaining Knowledge: Vegetable substances, vol. iii. page 229.

The Oil Plant, or Camellia oleifera.

"This beautiful shrub is a native of China, where it is cultivated in large plantations, and produces much of the oil consumed by the Chinese. Its product being oil, and its appearance closely resembling the Tea plant, the Chinese give it the expressive and appropriate name of the 'Oil-bearing Tea plant.' It frequently attains the height of a moderate sized Cherry tree, and bears a profusion of large, single white blossoms. 'This circumstance,' says one of our best travellers in China, 'gave an interesting and novel character to the places which it covered. They often looked in the distance as if lightly clothed with snow, but on a nearer view, exhibited one immense garden.'

"A red sandy soil on which few other plants will grow, seems to be the best adapted to the *Camellia oleifera*."

I shall mention two other tropical trees: the *Cocos butyracea*, and the *Elæis guineensis*. They both bear fruit abounding in oil. According to Dr. MacCulloch, the quantity of this Oil (Palm oil) imported into Great Britain in 1829, amounted to cwt. 2963: 17, valued at £ Stg. 179,921-17. Dr. MacCulloch also says, in his account of the trade of Sierra Leone, that, "The great article of import from the Coast of Africa, is Palm oil, and of this more than fifty times as much is imported from the Coast to the South of the Rio Volta, several hundred miles from Sierra Leone, as from the latter." I believe the trees are found in the greatest abundance in Senegal to the North of Sierra Leone; there is little doubt, but what they would succeed in India, the climates being pretty nearly alike.

It had nearly escaped me to mention, that I have also forwarded to you about one quart of Butea kino, in a bottle.*

I remain, &c.

Rajharra, 27th Aug. 1845.

C. B. TAYLOR.

PROGRESS OF THE BRANCH AGRI-HORTICULTURAL SOCIETY OF
BHAUGULPORE.

To JAMES HUME, ESQ., *Honorary Secretary Agri-Horticultural Society of India.*

MY DEAR SIR,—I have the pleasure to enclose an account of an Agri-Horticultural meeting, which took place here on the 14th instant, and shall feel obliged by your submitting it for the information of the Parent Society at your next meeting.

* I remain, &c.

Bhaugulpore, 22nd Nov. 1845.

T. E. A. NAPLETON,

Honorary Secretary.

At a meeting of the Bhaugulpore Agri-Horti. and Floricultural Society, held on the 14th of November 1845, 'numerously attended by the European and Native Residents,—

* "I have at length procured for you a sample of about one seer of Polase Gum, or Dak Gônd, a substance which it appears by a paper in the Society's Journal, Part IV. of vol. III. by Mr. E. Solly, Junior, has already attracted some attention in England. The gentleman just named, proposes to call it Butea Kino, and anticipates that it will become a valuable article of commerce, and moreover says, 'And from its *probable cheapness*, it promises to be of considerable value in the arts, and especially in that of tanning leather.' I am afraid that Mr. Solly's anticipations will not be realized on this side of India, and that from causes directly opposite to those which he states as making it probable that it will become of 'considerable value in the arts,' which, according to his expectations, is its *probable cheapness*. What will prevent it from becoming a valuable substitute for other tanning substances now in use is its *probable dearness*; I say *probable dearness*, because there is a chance that in other localities where the tree may be found in great abundance, it may yield a larger quantity of the gum than those in my neighbourhood, which have all been once cut down by the cultivators of the soil for the purpose of converting the wood into ashes to manure their lands with; this may account for the small quantity of gum which each tree has been ascertained to yield, which is only a few drachms. I shall reserve the sample to send along with the samples of oil, unless you desire to have it immediately: all the oils will not be ready for the next month or two."—*Extract of a Letter from Mr. TAYLOR, dated 27th April, 1845.*

Mr. G. F. Brown, in the chair.

The Honorary Secretary read,

1st. A statement of donations in money during the past year, amounting to Rs. 293.

*2ndly. Of other donations, as follows :

From the Parent Society—Two silver medals, a money donation of 50 rupees, several consignments of agricultural and horticultural seeds ; and it is but proper to add, that unceasing attention to our wants, and every kind wish for the well-doing of our Branch Society, have ever been evinced by the Parent one.

From Dr. Wallich, Superintendent Honorable Company's Botanical Gardens—Seeds, plants, and every assistance that could be desired.

From Colonel Ouseley, Governor-General's Agent at Chota Nagpore—Some plants of edible date, 60 bottles of Nerbudda white linseed, and 30 bottles of Nerbudda wheat ; all having arrived in splendid order, although sent in the rainy season.

From the Honorable Sir L. Peel—A packet of flower seeds, which vegetated freely, and the plants were highly ornamental and much admired ; also a number of rare plants.

From Captain Hollings—A large collection of grafted fruit and other trees, together with an assortment of fresh and good seeds ; and it is most gratifying to see the Honorary Secretary of the Lucknow Branch Society, although so far away, taking the lively and zealous interest he does in the welfare of our Branch one.

From John Hamilton, Esq. of Calcutta—Some rare and beautiful plants.

From G. W. Bartlett, Esq. of Calcutta—A number of beautiful plants, amongst which the "Cordia Sebastena," was highly appreciated.

From J. C. Richards, Esq. of Calcutta—A number of Heart's-ease plants, and a box of Dahlia bulbs. *

From David Gibson, Esq. of Malda—30 Malda Mango grafts of the rarest kinds.

From Edward Haworth, Esq.—A donation of 12 volumes of Loudon's Gardeners' Magazine.

From E. Dussumier, Esq.—A donation of some French Radish seed, and a number of fine Pine-apple plants.

From T. Mullens, Esq.—A donation of vegetable and flower seeds.

From Major J. H. Simonds—A fine supply of double stock and Lucerne seed.

From E. F. Lautour, Esq.—A great number of Sylhet Orange grafts of the best kind.

From George Barnes, Esq.—A donation of one very fine Sapotah tree, and five Bombay Mango grafts.

3rdly. List of 38 new subscribers since the 30th of May, 1845.

4thly. It appeared that the sum of Co.'s Rs. 2,592 : 12 : 0 was realized in subscriptions, and that Rs. 483 on the same account were under collection. That the money donations amounted to Rs. 443, including the Hon. Sir L. Peel's annual handsome subscription of 100 Rs., and 50 Rs. from the Parent Society. That Rs. 113 : 6 : 0 was collected from the subscribers, who take a vegetable *dali* from the Public Garden, and the balance from last year's account of Rs. 279 : 10 : 6½, caused a total on the credit side of Rs. 3,912 : 0 : 6½. On the other hand, it appeared that the expenditure during the year, after paying off all demands, was Rs. 3,496 : 0 : 2, leaving a balance in favour of the Society of Rs. 416 : 0 : 4½. This was pronounced very satisfactory.

5thly. Proposed by the Honorary Secretary, and seconded by Mr. J. H. Young,—That a Committee of three members be appointed for the general superintendence of the affairs of the Society. *Carried nem con.*

6thly. Proposed by Mr. J. H. Young, and seconded by Mr. Hodgson,—That the Committee consist of Messrs. C. D. Russell, F. Gouldsbury, and G. F. Brown. *Carried nem con.*

Memorandum.

At the particular request of Mr. G. F. Brown, Mr. J. H. Young consented to supply his place as a member of the Committee.

7thly. The Honorary Secretary having reported that the seeds received this year from Messrs. Veitch and Co. had not turned out well, in consequence of having been stowed by our London Agents in a bad part of the hold of the ship, it was resolved that in future Messrs. Veitch and Co. should be held responsible for sending out their own seeds in good order, and that the London Agents be dis-

pensed with. Resolved also,—That in future this Society procure seeds from the Cape, America, France, and other quarters.

8thly. Proposed by Mr. Hodgson, and seconded by Mr. J. H. Young,—That the Society establish a small garden at Darjeeling, for the purpose of acclimating seeds which they receive from England and other parts of the world, a similar plan having been found to answer extremely well in the Upper Provinces.

Carried *nem con*, and resolved,—That as Mr. R. F. Hodgson is about to proceed on leave to Darjeeling, he be requested to make arrangements for carrying out the above object in conjunction with Dr. Campbell, whose assistance is solicited in the undertaking.

9thly. Proposed by Mr. R. F. Hodgson, and seconded by Mr. Wallace,—That where there are eight or more subscribers to this Society in any district, a twelfth of the annual subscriptions be set apart to be distributed by themselves as prizes at one or two public meetings (where the produce of the gardens can be exhibited) during the year, as an inducement to the natives to cultivate better vegetables, &c., provided that the subscribers in such districts apply for the amount, and that a report of such distribution be sent to this Society.

10thly. Proposed by Mr. J. H. Young, and carried by acclamation,—That the thanks of the Meeting be voted to the Honorary Secretary for the great care and attention which he has devoted to the affairs of the Society since its institution, and for the very satisfactory result of his management of the funds during the year. And,

Lastly,—The best thanks of all present having been voted to the Chairman, the meeting broke up.

T. E. A. NAPLETON,
Honorary Secretary.

G. F. BROWN,
Chairman.

Memorandum.

R. C. Raikes, Esq. of the civil service, has kindly consented to become an Honorary Joint Secretary for the district of Mymensing.

Memorandum of the result of an Experiment in crossing the Indigenous Cottons of India. By DR. A. BURN, Superintendent Government Cotton Experiments at Broach.

To the Secretary to the Agri-Horticultural Society of Calcutta.

SIR,—At the request of Dr. A. Burn, Superintendent of the Government Cotton Experiments at Broach, I have the honor to transmit to you the accompanying memorandum and plates.

I have, &c.

Bombay, 11th Nov. 1845.

L. R. REID.

The plant, from which this is a specimen, was sown at the beginning of the monsoon in July 1844, along with other plants of the *G. Arboreum*; it grew up and ripened its produce, but it differed from them in habit considerably. They grow and blossom all the season from November, until checked by the heat in April. It blossomed and yielded all its produce in the space of two months, like as the *G. H.* does, and it was free from the chief fault of the *G. A.*, viz. that of yielding too small a quantity of produce. In short, it had all, or nearly all, the good qualities of the parent plants. The plant grew to the height of six feet, and the lower lateral branches, four in number, were two feet long each, the remaining ones being shorter gradually up to the top of the plant. The number of blossoms was sixty, but only about fifty remained to yield produce, the others falling off. The color of the stem and other parts was greener like the *G. H.*, and not so black or dark-colored as the *G. A.*; the whole plant was also more hairy than the *G. A.* and resembled in this respect *G. H.*, the most hirsute of all the varieties of the Genus *Gm.* The color of the blossoms was chiefly red, but at the roots of the petals the yellow color of the *G. H.* flowers was vivid, and more distinct than is shewn by the dried specimen.

The produce from the 50 bolls weighed equal to 4 rupees and 3 quarters, or 855 troy grains, and for the sake of comparison in results, an equal weight of produce from *G. A.* was examined at the time along with that of the cross plant. The results were as follow:

Cross plant, wool grains,	239	=	28 per cent.
—————, seed —————	607½	=	71 ditto.
—————, loss and dust,	8½	=	1 ditto.
	855		100
 G. Arboreum, wool grains,	191½	=	22½ per cent.
—————, seed —————	658	=	77 ditto.
—————, loss and dirt,	5½	=	0½ ditto.
	855		100

This shows clearly that improvement as to quantity of wool has been one result of the crossing. 28 per cent. is, I believe, equal to the yield of the best New Orleans produce in America, and in this instance the quality of the wool, in my opinion, is quite equal to the best New Or-

leans to be found in the English markets. It is superior to the best Broach or "Surata." One fact, however, should be noticed; the yield of the G. H. here on *fallow* land is commonly 33 per cent.

The G. A. and G. H. are eminently suited to the climate here, which none of the foreign varieties are; a knowledge of the climate as to *distribution* of moisture is the grand desideratum in India for successful cotton culture. The average fall of rain at Broach for 1843 and 1844, was 38 inches 31½ cents. The average of Bombay, as given, I believe, by Mr. Noton, is 76½ inches, showing an excess over Broach of 38-18½, or double in amount. Now the two last seasons at Broach are considered to be above the average fall, and too much for successful cotton crops. Cotton cannot be raised near Bombay, and if at Broach the fall of rain was any thing like that at Bombay, it is clear no cotton bushes could grow: they would be rotted by the excess of moisture, as they have been in all low places, during the past two seasons. These latter remarks apply chiefly to G. H. and G. A., for each variety of G. plant varies much in habit. Crossing appears to me to be a very likely mode of obtaining a better and more productive kind of plant than is at present cultivated in India. Witness the varieties of the Potato thus acquired, of the Hopeton oat now so universally esteemed in the Lothians. Use the pollen of some of the fine foreign cottons to impregnate the blossoms of the hardy, and suited to climate, G. A., and is it too much to expect to permanently improve upon it? In the case now under notice, I am perfectly satisfied of the success so far, but will the produce from the seed of any plant retain the improvement? We must try and see the results next season.

If an acre of land were planted with 7,000 plants, (not too many) and they yielded at the rate above stated, or take it only at grains 720 each plant, then the wool would amount to lbs. 201, and at 4d. per lb., or lbs. 6 per rupee, its value would be Rs. 34, a sum one-third of which would be ample to cover the expenses of cultivation, if judiciously gone about.

The number of seeds from the 855 grains of produce was,
Cross plant 676 good. G. A. 762 good. Difference in number 62.

27 bad*

3 bad.

703

765

Broach, 25th January, 1845.

(Signed)

ALEXANDER BURN.

P. S.—It is clear the cause of the partial success attending the experiments in cultivation of the American Cotton plant both at Coimbatore and Dharwar, depends on the moisture of both monsoons affecting the atmosphere of those two places, on different sides of the Gâts, with a degree of moisture, the continuance of which is sufficient to admit of the growth and maturation of the produce. The pass in the Gâts at P. admits of this.

On "*Gutta Percha*," a peculiar variety of *Caoutchouc*. By DOUGLAS MACLAGAN, M.D., F. R. S. E., &c. Communicated by the Royal Scottish Society of Arts.

[Dr. Douglas MacLagan's Paper is chiefly interesting, as confirming the general correctness of the analysis published in the 5th No. of the 2nd vol. of the Society's Journal, at page 104. The subsequent identification of the plant by Mr. Griffith, as belonging to the Nat. order "*Sapotaceæ*," from a small specimen forwarded to Dr. Mouat, by the late Rev. Ed. White, with a further analysis of it, will be found at page 146, of the 3rd vol. of the Journal. A complete botanical description of the plant was also furnished by Mr. White, and published in the 4th vol. of this Journal, at page 59. It is satisfactory to the Committee of Papers of the Agri-Horticultural Society of India, to find that the whole chain of investigation connected with this important and interesting vegetable substance, was completely and accurately followed out in this country,—made known in the pages of this Journal, and finally corroborated by the experiments and observations of distinguished practical men in Europe.]

Gutta Percha, is the Malayan name for a substance which is the concrete juice of a large forest tree, native of the shores of the Straits of Malacca, Borneo, and the adjacent countries. The tree yielding it is unknown botanically, all the information we possess regarding it being, that it is a large forest tree, and yields this product abundantly. We are indebted for our knowledge of it to Dr. W. Montgomerie, H. E. I. C. S. whose spirited exertions to improve the cultivation of various articles of colonial produce at Singapore, have obtained for him several distinguished marks of approbation from the Royal Society of Arts of London. For his communication regarding *Gutta Percha*, Dr. Montgomerie received a silver medal from the Society.

The substance in its crude state differs in many particulars from common caoutchouc; it is of a pale-yellowish or rather dirty white colour. It is nearly as hard as wood, though it readily receives the impression of the nail. It is very tenacious, and not at all elastic.

It seemed to me to be worth while to determine, whether or not this substance really was a variety of caoutchouc, and for this purpose I subjected it to the ordinary process of ultimate analysis, and obtained as its per centage composition, carbon 86.36; hydrogen 12.15; the remainder, 1.49, was most probably oxygen absorbed from the air during the process employed for purifying it, as the substance, whilst heating on the vapour-bath, acquired a brown colour. The only analysis of common caoutchouc with which I am acquainted is that of Faraday, who obtained, carbon 87.2; hydrogen 12.8. The results are sufficiently near to warrant the conclusion that the two matters in question are generally the same.

I found also that the *Gutta Percha* yields the same product of destructive distillation as the common caoutchouc. Without entering into

details, I may briefly state, that both equally yield a clear, yellow, limpid oil, having no fixed boiling-point, and, therefore, being a mixture of different oleaginous principles. In both instances the distillation proceeds most freely at temperatures between 360° and 390° Fahr., and seems almost stationary at 385°. Comparative analysis of similar portions of the two oils were made, and as is already known of common caoutchouc, the products exhibit a constitution represented by the formula C. 10. H. 8. The Gutta Percha thus appears really to be a modification of caoutchouc.

In its general properties it likewise shews a similarity to common caoutchouc. It is soluble in coal, naphtha, in caoutchouc oil, and in ether. It is insoluble in alcohol and in water, and floats on the latter.

Its most remarkable and distinctive peculiarity is the effect of heat upon it. When placed in water at 110°, no effect is produced upon it, except that it receives the impression of the nail more readily; but when the temperature is raised to 145°, or upwards, it gradually becomes so soft and pliant as to be capable of being moulded into any form, or of being rolled out into pieces or flat plates. When in the soft state it possesses all the elasticity of common India-rubber, but it does not retain those properties long. It soon begins again to grow hard, and in a short time, varying according to the temperature and the size of the piece operated on, regains all its original hardness and rigidity. A ball one inch in diameter was completely softened by boiling water in ten minutes, and regained its hardness completely in less than half an hour. It appears to be capable of undergoing this alternate softening and hardening any number of times without change of property.

It is also to a certain extent ductile. When soft it is easily torn across, but when hard it is very tenacious. A piece not an eighth of an inch in thickness, when cold, easily raised a weight of forty-two pounds, and only broke when half a hundred weight was attached to it.

From these properties it seems capable of many applications in the arts, its solution appears to be as well adapted as that of common caoutchouc for making water-proof cloth, and whilst softened it can be made into solid articles, such as knife-handles, door-handles, &c. The Malays employ it for the former of these, and prefer it to wood. A surgeon furnished with a small piece could easily, with the aid of a little hot water, supply himself with bougies or pessaries of any size or form.

[Dr. M. exhibited a knife-handle, a walking cane head, a riding whip, and other articles made of Gutta Percha.]

[From the *Edinburgh New Philosophical Journal*. for October 1845.]

Brief Observations on some of the Pines and other Coniferous Trees of the Northern Himalaya. By CAPTAIN EDWARD MADDEN, Bengal Artillery.

The Pines and allied trees of the Himalaya, both in size and number of species, probably surpass those of any portion of the globe, excepting perhaps California and the adjacent Coasts of N. West America, where the late traveller Douglas discovered two or three species which have been named after him, some of which exceed in dimensions even those of the Himalaya, so far as I am acquainted with them.

The following observations are chiefly founded on remarks made during journeys into the interior of the mountains, several years ago, and having only my memory to trust to, in some cases, and no very intimate knowledge of the subject in any, they will necessarily be of a very desultory and imperfect nature, and as such are intended for non-botanical readers, comprising the great majority of those who visit our N. W. Hill stations, and who are, for the most part, so unacquainted with these matters that I am induced to believe my remarks will not be unacceptable. In drawing them up, I have borrowed freely from whatever sources of information were accessible, to supply, as far as I could, the deficiencies of personal examination. I have endeavoured to specify the quality of the timber afforded by each tree, and to note those, the introduction of which is desirable for their utility or beauty, and have indulged in certain Etymological and Antiquarian enquiries, perhaps more proper to Jonathan Oldbuck than to Linnæus, but which may serve in a small degree to relieve the dryness of the subject. Lastly, in arranging such of these trees as I am acquainted with, I have adopted the most recent classification, that of Richard, which appears to me more simple and perspicuous than that of Linnæus (in part, retained by Lindley) who grouped most of them under a single genus, PINUS, which, in the modern arrangement is divided into five genera, viz. ; PINUS, ABIES, PICEA, LARIX and CEDRUS; these, with *Araucaria* and a few more, constitute the Section ABIETINÆ, as distinguished from CUPRESSINÆ, comprising the *Cypress*, *Juniper*, &c., and TAXINÆ, the *Yew Tribe*.

I.—PINUS. In this genus the leaves are long, thin, and, generally, bound together with fascicles at the base by membranous sheaths, each bundle containing from two to five leaves. The cones are more or less pendulous with scales hard, thick, and often beaked and prickly at the ends; they are also persistent, i. e., they remain attached to the rachis or axis, after the seeds have fallen out.

The word PINUS is derived by some from the Greek, pion "fat," in allusion to its resin and tar, and the Sanscrit Peena, has exactly the same meaning, hence the "Uberrima pinus" of Virgil. By others, from the Celtic, Pen, a mountain, in reference to its usual localities, while others find its origin in our own 'fine,' or the Latin, 'finis,' as well as 'pin,' &c., in allusion to the slender leaves which are aptly designated "needle leaves" by the Germans, and "acerose" by botanists.

Two species of Pine are common in the Himalaya, viz., PINUS *longifolia*, and *excelsa*: a third, PINUS *Gerardiana* is also abundant, but of very limited distribution.

1.—PINUS *longifolia*, commonly called *cheer* or *cheel* in the mountains, and *sarui* in the plains, which latter is the name in Sanscrit. Captain Raper mentions *Kholan* as another name in Gurhwal, and Royle gives

Thansa and *Sulla* as others; the last perhaps a corruption of *Surul*. The *Cheer* grows from 40 to above 100 feet high, and abounds in all the lower and outer ranges of the Himalaya from Bootan up to the Sufed koh, where it is, I believe, called '*shouty*' by the Affghans. It is also a native of China. Dr. Griffith describes it as descending in Bootan, to the elevation of 1800 to 2000 feet above the sea; and on the Sewalick range between the Jumna and Sutluj, we find it in abundance at 2500 to 3000 feet, as at Nahun; also, at Kussowlee and Bunasur from 3000 to 6000 feet, in perfection, and finally, it becomes stunted and disappears at Simla, at 7000 feet above the sea; it will not, therefore stand the severity of an English winter, which even kills the RHODODENDRON, unless protected, a tree occupying in the Himalaya a still colder site than the *Cheer*.

The *Pinus longifolia* has rough bark, divided by deep seams into large oblong plates; the trunk of the largest tree is about 12 feet in girth, with exceedingly picturesque heads, very irregular in outline, formed by long spreading boughs: the leaves are always in fascicles of threes, with long persistent sheaths; they are stiff and glossy, of a bright grass green, and so far as I have observed erect, though both Roxburgh and Don (in Royle) describe them as pendulous, and Loudon figures them as completely so; they seem to be developing only where the branches are so; they are, especially, on young trees, above a foot in length; and according to Roxburgh, they sometimes exceed 18 inches, which fully warrants the specific name; though *Pinus filifolia* and *macrophylla* on the mountains of Guatemala and Mexico, 12,000 feet above the sea level, have leaves in fascicles of 5, from 12 to 15 inches long. The male flowers of the *Cheer* are produced in long close clusters of many catkins, at the end of the branches; round at first, but elongating as they open, and blossom about the beginning of the hot weather, in February and March; the seeds ripen in twelve months, and are eaten by the hill men and by birds. The cones are either solitary, or in clusters up to 5, in a regular whorl; they are ovate, very heavy, from 5 to 7 inches long, and about 13 in circumference near the base, and the scales, which are much thickened at the end, have there a large thick spring beak. Large quantities of tar and turpentine are extracted from the wood by the natives of the Sewalick range, the method of preparing which is explained in the Journal of the Asiatic Society of Bengal for May 1833. The natural turpentine is called *Gunda Biroza*, *Birj* and *Cheer ke gônd*, in Persian *Birozeshur*; but the term *Gunda Biroza*, is also used for the frankincense of the *BOSWELLIA thurifera* (*serrata*, Roxburgh.) *Biroza* is, perhaps, from the Hebrew, '*be rosh*', the fir tree. In a catalogue of Indian woods, in the Journal of the Asiatic Society for April 1834, with remarks by Mr. Aikin, Secretary to the Society of Arts, the *Pinus longifolia* is stated to afford "excellent timber like Memel deal." Captain Cautley, however, states, that it is "held in no esteem" by the natives of Northern India, and by experiment it is found to be only half as strong as Saul. It has been extensively employed in the construction of the new barracks at Subathoo and Kussowlee, and when duly seasoned and protected from damp and wet, it seems to deserve Mr. Aikin's good character. It should also be felled of mature age, and at the proper season, and unless all these precautions are taken, it seems to be peculiarly liable to dry rot, and the attack of worms and insects. At best, however, it yields in durability to the kelou or cedar, over which it possesses only one advantage, that of bearing a great stress without flexure. It is also in general use at Ferozepore, &c.,

being the wood procurable there to which it is floated down the Sutledge. I am indebted to Mr. Conductor Mines for the following remarks on the *Cheer*:—"The quality of the wood differs more, perhaps, than that of any other pine consequent to its growing in high and low situations, that of the former of a good sized tree being superior, and in dry situations very durable, the fibres tough, more so than the keloo, it is therefore strong. The *Cheer* of the lower hills is not so durable as that of the higher; this I conceive to be from a rapid growth, and for this reason the trees of a forest differ much in quality; for the trees lower down the hill are of a much more rapid growth than those on its summit. Again, it would affect the quality of the timber if the trees grew very close together (this is applicable to all forests), and even the aspect affects the tree. A sapling of the lower hills will rot on the ground in six months; a piece of scantling from a larger tree of the higher hills in a dry situation (in a roof for instance) will scarcely exhibit decay during a century, while the same in contact with mineral damp would be quite decayed in about ten years. This tree grows to a large size, is branchless for 40 or 50 feet from the root, the boughs somewhat straggling, growing rather vertically than horizontally; the colour of the wood is light; it is full of turpentine, which follows the axe almost in a stream." Mr. Mines is of opinion, and I agree with him, that in the N. W. hills we have but one species, the differences in appearance being due to age, aspect, and other local circumstances, such as elevation, and being found in forests or solitary. The clumps and single trees on the Nahun range are very handsome with dense, bushy heads. In the volume "timber trees" of the Library of Entertaining Knowledge, I find the following confirmation of Mr. Mines's opinions:—"Generally speaking, the timber (of the pine) is more hard and durable. the colder the situation is, and the slower the tree grows, (as well as from the wood being more resinous,) and its peculiar positions; it is not unusual to find the Northern half of a common pine hard and red, while the Southern half, though considerably thicker from the pith to the bark, is white, soft, and spongy."

The natural history of the locust being now apparently an object of research, I may as well add, that on the 17th, 18th, and 19th of October 1844, when Simla and Kussowlee were visited by countless flights of these pests, they completely stripped many of the *Cheer* pines of their leaves growing at the base of each fascicle, so that the entire foliage was soon strewed on the ground about the roots of the tree.

Virgil celebrates the "*Pinus loquens*," and many of us listen with pleasure to the Æolian music executed during a breeze by the fir and cedars of Simla. When it occurs that the wood of the fir is also the material from which guitars, violins, and sounding boards are made, and that rosin, which is essential to the use of the bow, is also a product of this tree, one ought to be induced to give the Mantuan Bard the credit of being Vates in each sense of the word, and that he had in this case a vision of violincellos, and made a more lucky guess at futurity than in his Pollio. The use of the fir-wood for musical instruments is, however, at least as old as the time of David: 2 Sam. vi. 5.

Our European visitors at Simla and Mussoorie are accustomed to identify the *Cheer*, some with the Scotch or Norway fir (*Pinus sylvestris*), and others with the pinaster or cluster pine, from each of which, however, it differs materially. The leaves of the Scotch fir

are always in pairs, and are not above three or four inches long, and the tree flourishes best in a climate which would speedily destroy the *Cheer*, being found as far north in Europe as a degree or two within the arctic circle, and as high as 2000 feet above sea level on the mountains of the North of Scotland. The pinaster certainly resembles it in habit, but has also its leaves in pairs, not in threes, and only about half the length of the *Cheer*, while its cones, rarely solitary, are generally in clusters of from three to eight; in the *Cheer*, they are often solitary, and I never met above five in a whorl, arranged indeed so regularly round the branch as well to warrant the application of the name (pinaster, star-pine) had it not been previously and more correctly appropriated. Royle, however, mentions a pine in Nepaul which I have not seen, *P. Nepalensis*, which is classed as a sub-species or variety of the pinaster, and nearly allied to *Pinus sinensis* from China, both with leaves in pairs. The nearest Western approximation to the *Cheer* is *P. Canariensis*, a native of Teneriffe, &c.

Many of the European and American pines are well deserving the consideration of the Simla Horticultural Society for introduction to the Himalayas. *Pinus Sylvestris* (the keifer or foher of the Germans; hence, our word fir) affords the well known timber, red, yellow, and Memel, or Riga deal, from the rocky mountains of Scandinavia and the sandy plains of Poland, &c. *P. Mitis*, the "yellow Pine" of America, is excellent for timber, the sapwood excepted. *P. Laricio*, the Corsican Larch, common also in Spain, supplies an excellent red timber much used by the French in ship-building. *P. Australis* or *palustris*, the swamp or long leaved Pine of Georgia and Virginia, grows 60 or 70 feet high, and yields the best spars for masts of all the American Pines. It is too tender for England, but would flourish with the *Cheer* of the east. American tar and turpentine is extracted from this tree. *P. resinosa* affords the Canadian Red Pine. *P. Lambertiana* grows 230 feet high; has cones from 14 to 18 inches long, with edible seeds, roasted or pounded into cakes. It grows in North California and New Albion, where Douglas measured one which had been blown down, 215 feet long, 57 feet 9 inches in girth, at 3 feet from the ground, and 17 feet 5 inches at 134. The timber is soft, spongy and white, like that of the spruces, and useless, except that when partly burned, the turpentine acquires a sweetish taste, and is used by the natives as sugar. *P. Sabiniana*, also from California, grows 140 feet high and 12 in diameter, clothed with branches to the ground, and with woody cones 6 inches in diameter. *P. Ponderosa* from the same regions has, singularly, heavy, close-grained and durable timber.

2.—*Pinus excelsa*. The "*Kail* or *Kael*" of the Simla Hills, the "*Leem*" of Kunawur, and I believe the *Yari* of Kashmeer, is pretty common at Simla on warm aspects, as below General Lumley's house, and various parts of Chota Simla about Glencoe and Torrentium. It is also found in abundance about Kotgurb, Theog and many sites of similar elevation all over the interior, from about 6,500 to 8,500 feet: from 5,500 to 9,500 in Bootan: above 11,800 feet in Kumaon, and Colonel Hodgson mentions it as occurring above the cedars with birch towards Gungantree. (As. Res. xiv. 107).

Captain A. Gerard also mentions the Leem as occurring with birch, &c. on both sides of the Shatool Pass up to 12,000 feet. So far as I recollect the *kail*, it is not entitled to its specific name "*excelsa*," but it is said in Nepaul to attain an immense height; Loudon gives 100 feet, but it probably attains 120. As seen in the woods about Kotgurb,

&c., it is a large spreading tree with long horizontal boughs, for the most part coming off the trunk much closer to the ground than in the *Cheer*, diminishing upwards, so as to form a spreading cone rather than a large head or crown as in the *Cheer*. The bark is smooth, and the leaves are of a glaucous, or bluish green, very distinct from the bright tint of the *Cheer*, from which they also differ by their having from three to five, but generally five leaves to each fascicle, which, as in *P. Strobilus*, a nearly allied species, is destitute of a sheath at the base: the leaves are from six to eight inches long, very slender and drooping, and Dr. Royle observes, that it is the "Weeping Fir" of Himalayan travellers, a designation which would more appropriately belong to the *Res* or *Abies Smithiana*, and on reference to the *As. Researches* xi. 518, I find that Captain Raper describes his "Weeping Fir" by characters which only belong to the latter.* The cones of the *Kail* are solitary or in clusters, completely pendulous, very long and slender, and while young, of a pea-green colour; no others in these mountains approach them in length, being from 8 to 13 inches long, the scales obtuse, and thickened at the end, but without the incurved beak of the *Cheer*: the seeds ripen from the middle to the end of October. Both the tree and its cones afford a great abundance of highly fragrant turpentine, and the tar sold in the Simla bazar is, for the most part, supplied by this tree. The cones are so inflammable as to serve the same purpose in lighting fires as the bog or peat pine does in Ireland and Scotland. Captain P. Gerard who possesses volumes of inedited memoranda on almost every subject connected with these mountains, informs me that the wood is considered excellent for the manufacture of charcoal intended for the fusion of iron ore, and that its leaves and branches, as well as those of the *Kelou*, are much used for litter and manure: those of the *Kail* and *Cheer* are also advantageously substituted for hair to bind clay used for plaster. When they fall from the tree and cover the ground, it becomes as slippery as ice, as every one will recollect who has had occasion to traverse a wood composed of *Kail* or *Cheer*.

The *Kail* timber is said by Captain P. Gerard to be extensively used in the hills, and to be preferred to the *Cheer*; it is white, soft, has much alburnum or sapwood, and besides warping when exposed to the sun, in the form of planks, is said to rot rapidly if placed in contact with damp earth; but when protected from moisture, ranks next to the cedar (*Kelou*). Mr. Aikin merely remarks "wood remarkably compact." Mr. Mines estimates it next after the *Cheer*, and says "the wood may be considered the red deal of these hills: it is knotty, and lasting in dry situations, but exposed to dampness of any sort will soon

* During a fine, dry winter, such as the present one of 1844-45, in the months of December and January, the leaves of the *Kael* pine were completely covered by a sweet, transparent, liquid substance which collected on the branches and leaves, and, as it dried, matted the latter as if with glue. This substance concreted into a pure, white manna, of the consistency of honey or sugar, hanging down from the branches in the form of long or rounded "tears." In this state, it is eaten by the hill men, and is extremely sweet and palatable, without any flavor of turpentine. Abundance of it also falls to the ground, where it covered the stones with a coating as hard and transparent as the finest varnish, and the leafless branches of willows, &c. were quite enveloped by it as with so much French polish. It was also produced on the cedar, oak and *Авдromеда*, but far less copiously than on the *Kael* pine. The mountaineers believe it falls from Heaven; to me it seemed to exude from the leaves, but Captain Hay informs me that it was, in fact, secreted by a species of *aphis*, of a dark, brown color, about one-tenth of an inch in length, which was to be seen in multitudes on the branches. We learn from Burkhardt, that the manna of Mount Sinai, still called Manni by the Arabs, drops from the tarfa, a species of tamarisk, probably our *furas*, "only in years when copious rains have fallen," as last season at Simla. — *Travels in Syria*, p. 599—604.

decay; hence it is never used by the natives," who, however, bring in to Simla for sale, split shingles of it called *dudgies*.

In experimenting on specimens of this and other Indian trees, there is considerable risk of being misled by reliance on native names, the tree should always be recognized previously by its proper characters: thus, about Kotgurh and Nagkunda, the *Kail* is universally known by the name *Cheer*, by which, at and below Simla, *Pinus longifolia* is always meant, and Col. Hodgson says (As. Res. liv. 85) the same mistake is made in Gurhwal towards Gungautree, where the "*Kail* is confounded with the *Cheer*." Colonel Hodgson describes the *P. excelsa* as being there a very tall and graceful tree, and calls it the "true deal pine," with wood light, and of a fine grain.

In most particulars, the *Kail* approaches very closely to "*Pinus Strobus*, which, though called the Weymouth Pine, is a native of Canada and the neighbouring United States, where it attains a height of 100 to 150 feet, and produces the clean, soft, white, but perishable, timber imported from America, under the name of 'Pine' or white Pine, much used for masts, but of little strength, and giving a feeble hold to nails. *Kail* timber has, probably, nearly the same properties; and in Nepaul, there is said to be a variety of the *Kail* still nearer the Weymouth Pine than the Simla one, which seems to have rather longer and stouter leaves than *P. Strobus*, with cones twice as long.

3. *Pinus Gerardiana*. The *Neoxa Pine*, called *Rhee*, or *Ree* in Kunawur; *Shungtee* by the Thibetans of Hungrung; and *Kununche* and *Koneunche* by others of the same race. It is, I believe, the *Sonoubar Sukkar*(*) of the Persians and Arabs, and flourishes from 6,000 to 11,000 or 12,000 feet above the sea: it does not grow naturally on the Southern side of the Snowy range, but is found in great abundance, forming large forests, on its North side in Kunawur, beyond the influence of the periodical rains, where it grows in very dry, rocky ground, rejoicing in the clefts of the "Herbless Granite," and occasionally on the clay slate. I have heard, that it extends sparingly to Wangtoo Bridge and Nachar; and that it has been introduced at Seran; but that the fruit never ripens in any of these places, which are all deluged in the wet season. Its manner of growth differs, considerably, from that of the other Pines: the trunk is of large girth, but scarcely attains the height of the *Cheer*: the boughs, which it commences to throw off 8 or 10 feet from the ground, are very crooked and straggling, and the bark, which is smooth, whitish and spotted, peels off in large flakes like that of the Birch, disclosing the smooth, green, inner layers. The upper branches form a large, compact, conical head. The leaves are stiff and glaucous, in fascicles of three, with deciduous sheaths, and to the best of my recollection, are about as long as those of the *Kail*. The *Neoxa Pine* affords abundance of fine turpentine, and the cones exude a copious white resin: it flowers in June and July, and the pollen of the male catkins is even more plentiful than in the cedar, so that, on shaking a branch at that season, one is quite deluged with the golden shower. The cones are more cylindrical than in the *Cheer*, and are of a bluish color, from 8 to 10 inches long, and 14 or 15 in circumference near the base, being the most bulky of any in these mountains, as those of the *Kail* are the longest: the scales are thick and blunt, much recurved, and spinous at the apex. Each

* Or, "Sweet Pine Nut." Golins gives a Pine and its Nut as the meaning of Sunoubar. The phrase 'Sunoubar Sukkur' may denote the 'Pistacio Pine.'

cone contains about 100 seeds, which ripen in September and October, so that they take 14 months to come to maturity. In order to extract them the more easily, the inhabitants collect the cones into stacks, before the seeds are quite ripe, and disengage them by means of a gentle fire: they are about an inch long, nearly cylindrical, with little or no wing, and are very palatable, with a slight, and not unpleasant flavour of turpentine. They are sold in the Simla bazar under the name of *Neoza*, and are, with great probability, supposed to be identical with the *Chilghoza* of Afghanistan, the produce of a pine common on the Sufaid Koh near Jellalabad, and in Kafiristan, where the climate, probably, resembles that of Kunawur. Lieutenant Irwin tells us "*Chilghoza* bears a large cone, and that the seeds are idly supposed to possess many good qualities," amongst which, that of easy digestion is, certainly, not to be reckoned one. Either *P. Gerardiana* or *P. Cembra* affords, probably, the edible pine seeds which Sir Geo. Staunton says are much relished by the Chinese. Mr. Vigne found the *Neoza* to the North of Kashmeer and in Astor; whence it no doubt ranges up to Kafiristan, &c. I am ignorant of the quality of the timber, but its place of growth is so remote and inaccessible, and the trunk is so bent and contorted, that it can never be of any importance for building purposes, and the seeds are also too valuable as an article of food to admit of its being felled. Europe possesses two Pines, of which the seeds are edible, viz. *Pinus pinea*, the *Stone Pine* which has its leaves in pairs; and very large, smooth, shining cones, 4 to 6 inches long, and requiring, it is said, three years to ripen; the seeds, considerably larger than the *Neoza*, are called *Pignons* in the South of France, and *Pinon* in Spain. The tree is common about Villas at Naples and Rome, and forms "*Ravenna's* immemorial wood." It has been completely naturalized at the Cape of Good Hope, and with the following would perhaps thrive at Simla, where the rains destroy the *Neoza*, at least, as a fruit tree. *Pinus Cembra*, a native of Siberia, the Tyrol, the North of Italy and the Mountains of the Bernese Oberland, where it is called *Arth* and *Tannenbaum*: it is the *Aralla* in Savoy, the leaves are in bundles of 5; the cone is oval, and here again the seed is without a wing, as if nature intended us to secure it the more easily. *Cembra* is said to attain a height of 120 feet in Siberia. I have already mentioned the edible seeds of *P. Lambertiana* in North America; and in South America, the *ARAUCARIA imbricata* (or *Dombeyii*) now becoming a deserved favorite in English lawns and parks, yields a nut as large as an almond (about 200 to each cone) which is an important article of food to the Indians of Chili and Peru, the seeds of *ARAUCARIA Brasilienses* are sold in the market at Rio Janerio. There is ample room in the Himalaya for one or all of these, and their seeds would furnish an excellent substitute for such wretched trash as the fruit of the *Pyrus variolosa* (the wild pear of Simla) which we may see the hungry Hillmen often devouring for want of something better. Either *P. pinea* or *P. pinaster* is the picturesque tree which Claude and several of the Painters of Italy loved to introduce into their landscape masterpieces. The former grows with a large stem topped by a vast canopy of branches.

II. *Abies*: the *Spruce*. In this Genus, the leaves are short, stiff, solitary, scattered round the branches instead of being collected into bundles. The cones are pendulous, with persistent scales, of which the outer edges are not thickened as in the *Pinum*, but end in a thin brittle membrane.

The regular spirals in which the scales of this and other fir cones are arranged to the right and left, are worthy of observation. Professor Henslow has some curious remarks on their geometrical properties applied to the distinction of species: a similar symmetry may be seen in the spines of many species of *Cactus* and *Euphorbia*. The name *Abies* comes from 'abeo,' to rise, to spring up, in reference to its lofty stature, or it may, perhaps, have been a corruption of *albus*, the *Abies* of Virgil and Pliny being our *silver fir*, so called from its white leaves as seen from below.

1. *Abies Smithiana*, the *Himalayan spruce*, called *Rai*, *Re*, *Ro* or *Row* in the Simla districts; *Realla*, or *Rher* in Gurhwal, where however, Colonel Hodgson also found it known as *Rhoh* and *Rhai*. It is the *Ryung* of Kunawur, and Captain A. Gerard frequently mentions it under the names *Ro'oo* and *Roo'ee*, which are also applied to the *Pindrow*, meaning apparently no more than we do by the general term pine or fir. The Chumba people occasionally call this tree 'Tos', which properly denotes the *Picea Pindrow*. Royle names it in his plate *Pinus Khutrow*, but as far as I can learn, *Khutrow*, though little known about Simla, is equally applicable to the *Pindrow*; and as the meaning appears to be "wood pine"—*Kuthrow* belongs more properly to the *Pindrow*, which affords the better timber of the two. Royle has identified his own *P. Khutrow* with the *Pinus (Abies) Smithiana* of Wallich, which he tells us, is also occasionally called *Morinda*; and young trees in England are often labelled *Abies Morinda*. A fatality seems to rest over the names and descriptions of this tree: the Penny Cyclopædia, apparently quoting Wallich, describes *Pinus Smithiana* as being the *Indian silver fir*, "a tree of enormous size," called *Raga*, and reaching in Kemaon to the region of birch. The cones are stated to be erect, from four to six inches long, ovate-oblong, with a very even brown, obovate, rounded scale, covered with a glaucous bloom. Now this position of the cone, and the name *Raga*, point either to *Picea Webbiana* or *Picea Pindrow*; but then the leaves of *P. Smithiana* are said to be slender, four-cornered, whitish beneath, dark green above, one to one and a half inch long, a little turned towards one side, and with small seeds: characters, except the whiteness below the leaf agreeing with those of the *Rai*, which is otherwise not described in the Penny Cyclopædia, in which, however, the account seems a confused jumble of *Abies Smithiana* and *Picea Webbiana*; the true "silver fir" of our mountains. The *Pinus Smithiana*, or *Rai*, is only to be seen at Simla, in the glen by Lord Combermere's Bridge, where a few specimens give an idea of its mode of growth, but little or none of the magnificent tree which it becomes on the lofty mountains of the interior, from Bootan up to Kafiristan, such as Muhasoo, Kumuloree, Huttoo, Choor, the main range; and generally those of Kumaon, Gurhwal, Sirmoor and Busehur at elevations of from 7000 feet to 12,600 above the sea. Dr. Griffith found it to abound in Bootan from 9,500 to 11,600 feet; and at Olipore towards Chooghur Serai, at the head of the Koonur valley, he obtained from the neighbouring mountains of Kafiristan, "specimens of a beautiful *Abies* or spruce, apparently allied to the *Morinda* or *Khutrow* of the Himalayas." The *Rai* is not only a very superb, but a very graceful tree; the boughs ascend a little in the young trees, but are horizontal in the old ones, and from these the branches and small twigs droop in vertical plane, in the most graceful manner, quite a contrast to the cedar, which has all its boughs and branches in horizontal planes. The leaves are

quadrilateral, somewhat curved, from one and a half to two and a half inches long, with excessively sharp points, and are scattered singly at nearly equal distances around the branches; this characteristic and the elegant pensive branchlets, mark the tree beyond the power of mistake. The cones are pendulous from the extremities of the branches, they are nearly cylindrical, six or seven inches long, and when old of a rich brown or purple. The seed ripens in October and November, and is by far the smallest of any of our pines. Loudon's supplement to his Encyclopædia of plants identifies *Abies Smithiana* with *Abies Morinda* and *Pinus Khutrow*, and states its height at fifty feet, but it may frequently be seen thrice that. When young, the *Rai* has considerable resemblance to the *Norway Spruce*; it is thickly clothed with bushy branches to the ground, declining, but not drooping as in the mature tree; and this difference has probably led some travellers to the conclusion that there was an undescribed species in the woods of Muhassoo and Huttoo.

The *Abies Smithiana*, in its preference of Northern aspects, is but one instance of many of a phenomenon which strikes every traveller in these mountains, that of the Northern and North-Western aspects being densely wooded, while the South and South-Eastern are wholly, or almost wholly, bare. Thus on Muhassoo, we may observe the *Rai*, the Maple, &c. to commence, where the Cedar forest terminates, not so much from the increased elevation, which only amounts to 9000 feet, as from the change of exposure; the Cedar, apparently flourishing on the more sunny declivities, while the former (with the *Pindrow*, next mentioned) delight in the rich and deep black vegetable mould of the still steeper Northern flanks, which supports also a multitude of shrubs and Herbaceous plants, and proves by its great depth, that this state of things has remained unchanged for many ages.* It has been also truly remarked, that these wooded aspects are almost invariably the most steep and rugged, no doubt, from the direction of the stratification, which brings the out-crop of the rocks into that quarter, affording at once a ready penetration to the roots between the layers, and preventing the removal of the soil by rains: thus at Kusowlee, may be noticed a steep Southerly slope, perfectly bare except in one spot, where the rocky strata cross out in a long thick band, which is covered with a brushwood of *HAMILTONIA*, *Shrubby Senaios*, &c. The Northern slopes are also more exposed to the disintegrating effect of frost and ice, which break up the rocks and more rapidly convert them to soil; while the precipitous declivities not only tend to secure the trees from the ravages of cattle and wild animals, but also from the violence of the South and S. W. winds, the influence of which Dr. Griffith (who remarks on the phenomenon in Bootan) thinks quite a sufficient cause to keep down all luxuriant vegetation. Hence, upper Kunawur and Thibet, where the winds, even at midsummer, are extremely furious and searching, exhibit to us one monotonous tract of mountain or plain, altogether devoid of natural forest; the only trees being those planted near the villages for the sake of their fruit. Perhaps also the deluges of rain which assail the Southern aspects exercise an unfavourable influence on the growth of forest trees, by carrying down the soil to the rivers, rendering even cultivation im-

* Lieut. Irwin remarks, "Pines are not found in all situations, even of the cool countries, but prefer the steep sides of hills, never being found indigenous to plains or tame-featured hills."

practicable, except where the land is carefully terraced. Dr. Royle seems inclined to attribute much of the nakedness of the Southern exposure to the direct and powerful action of the sun's rays, which seems to be inimical to the growth of many of the Himalayan Trees : and as we are ourselves natives of the same clime, which cherished the spruce and silver fir, this may read us an additional, though scarcely a necessary lesson, of the propriety of living as much as we can in the shade. Looking at the mountains from the South, it is very curious to observe how, in many cases, their craggy summits are feathered with Pines, the uppermost members of a dense, but invisible forest, while scarcely a bush is to be seen on the South side ; and hence, also in marching in the interior the abrupt antitheses of temperature which occur from "suns that dart intolerable day" to the chill and gloom of a thick forest. It is, I suppose, to this circumstance also that Major Wilcox alludes in his travels to the sources of the Burramputra (As. Res. xvii. 425) "on one side, there were no firs, though they abounded on the Northern mountains even at a much lower level." From his noticing their black appearance, the species is, probably, *Picea Webbiana* or *Pindrow*. Vigne, also, notices, that the Southern aspects in Kashmeer are rocky and bare of trees ; while the Northern and Eastern aspects of the Peer Punjal Range are covered with deep soil and dense forests ; the barrenness of the former is attributed by the Kashmerians to the hot winds from India. Moorcroft notices the same phenomenon : "On the Northern side, the steep acclivities of the mountains were covered with fir-forests ; those on the South were less abrupt, but more thinly wooded, the Pine evidently affecting a Northern aspect."—Travels, Vol. II. p. 96. Thus, whether it be the Northern exposure of an Alpine mountain or the frozen wastes of the North, nature provides her stores of most inflammable materials in the coldest situations. As a Timber tree, the *Rai* appears to be considered nearly worthless : the wood is white, and Colonel Hodgson says is not esteemed in Gurhwal for building, being heavy and knotty. (As. Res. xiv. 85.) When exposed to damp and wet, it is said to rot in a few months, and to split and warp from heat ; it is extremely difficult to work with the saw, and when split into planks, exhibits a very rough surface : it appears, however, that split shingles are preferred to sawn ones, from the texture of the latter being cut across more or less, and thus admitting moisture, which is not the case when the fracture follows the direction of the fibre, and thin shingles are said to be more durable than thick ones from their more rapidly and completely drying after rain. With all its defects, the *Rai* Timber is strong, more so than the *Kail*, and I am told is pretty extensively employed for beams and other in-door purposes, where it is protected from moisture ; and even in the form of shingles on native roofs, it is reported to have lasted 18 or 20 years. The remote and often almost inaccessible spots which the tree delights in may have tended to restrict its use as Timber. Mr. Conductor Mines observes of the *Rai*, that it attains a very great size, with a clean stem to a great height : "The wood is extremely soft, straight, and clean grained, of white color, and generally free from knots : it is considered to be of a very perishable nature ; and is, therefore, never used but in the shape of split shingles for roofs, for which, I should say, it is admirably adapted, as from its straight grain, it would split well, and in such situations it is lasting." He also remarks, that, "a young *Rai* tree differs so much from an old one, that the inexperienced would pronounce them

two distinct species." Mr. M. never fells this tree on account of Government, and careful experiments would be advisable before it is allowed to come into much use: native opinion is decidedly against it, formed, no doubt, on long experience. It does not occur in the catalogue of Indian woods examined by Mr. Aikin: he gives us, however, the character of *Pinus* (*Picea*) *Brunoniana* from Nepal; "wood soft, and of no value." This is found in Kumaoon, Nepal and Bootan, and is called *Tangshing** and *Changatasi Dhoop*, growing 70 or 80 feet high, with a spreading branched head: the leaves are about an inch long, covered beneath with a milky white bloom, but bright green and glossy, above, serrulate towards the point, and so easily shaken off as to be almost deciduous. The cone is erect, not above an inch long, with lax, ovate, blunt, pale brown scales. The wood is bad, and liable to warp. (*Penny Cyclopædia*.) It approaches *P. Canadensis*, and will, probably, be discovered in Kunawur as between Meerow and Roges. Captain A. Gerard mentions the following varieties of Pines. *Krog*, *Geosum* and *Manderung*, of which *Geosum* is probably the Cedar, frequently called *Geum* in upper Kunawur; while *Krog* and *Merung* may denote the *Picea Webbiana* and *Brunoniana*. Capt. Gerard, as well as Capt. Hutton, mention about the same place, as also on the Shatool Pass; "another variety of the Pine," called '*Spun*,' occurring with *maple*, *birch*, *mountain ash* and *black currants*, and which I suppose to be either the *Pindrow* or the tree *Juniper*, but no detail is given to tend to its classification.† *P. Brunoniana* is the *P. Dumosa* of Don.

The European tree which comes nearest the *Rai* is the *Norway spruce*; "the Fichtenbaum of the Germans, or *Abies excelsa*, so ornamental to our English lawns and plantations, and which in its native soil sometimes grows 180 feet high. It is densely clothed to the ground with branches, and grows in a pyramidal form, and though the branches decline, they do not droop so completely as the *Rai*. The leaves also are thicker, and about an inch shorter and less glossy and bright in their colour.

The timber is the white deal of the Baltic, and is only durable under cover; it is white, soft and knotty. *Abies alba*, *cærulea* and *nigra*, the American black and white spruce, are also occasionally met with in our shrubberies and gardens, and are exceedingly hardy, growing nearer to the pole than any other of the Pines. *A. nigra* has pendulous branches, and very dark, green foliage. *A. alba* (or *cærulea* ?) has stiff horizontal branches, with leaves under an inch long, of a pale bluish-green and exceedingly aromatic when crushed. *Abies Canadensis* is the hemlock spruce, and from the young sprouts of this, of *Abies nigra* and *excelsa*, is made *spruce beer*, so called from its being a decoction of the sprouts (German *Sprußisen*) of these trees mixed with sugar. This product is not, perhaps, of sufficient value to recommend the introduction of the trees which supply it, but if the seeds could be produced, the stupendous *Abies Douglassii* or *Taxifolia* is well deserving of notice. It forms immense forests in California, from 43 degrees to 52 degrees north latitude, is a quick grower, and thrives in England. A speci-

* Tangshing appears to be a generic term in Ludakh for Pine.

† In one of his Journals, Captain Hutton describes a tree called Jamoo at Nagkunda, which is Royle's *Ceranus Cousmota*. He also observes, that he could not find the *birch* between Nagkunda and Kotgurh; the *Bhojputra* is certainly not to be seen there, but by the streams, *Besla Cyliandrostachya* is common, with a clean trunk, and has been used in the new bridges, 1844.

men on the Columbia river measured 48 feet in girth, 3 feet from the ground: the bark is from six to nine inches thick, filled with receptacles of clear, yellow resin, and the height of the tree is from 100 to 230 feet. The cones are drooping, and are remarkable for their long 3-toothed bractes between the scales. The timber is very valuable, being heavy and firm, never warping, and nearly as deep in colour as yew. The introduction of the *Larch* to the Himalaya would be a real and an easier boon. Dr. Griffith, it is true, mentions his having found "a genuine larch," 10,000 feet above the sea, near Woollokha, in Bootan; but it would be a much simpler affair to import the seeds from England, where the tree has long been acclimated; its natural habitat is Siberia and the Alps which separate Switzerland and Germany from Italy, occurring in abundance and perfection on the Simplon and Splügen Passes, where the German name is *Lerkch*, origin of the Latin *Larix*. It is a very rapid grower, delights in steep rocky sites, and would, no doubt, flourish in juxtaposition with the cedar. That our rainy season would not injure it, may be inferred from the success which has attended its introduction on a great scale in the Duke of Athol's Estates about Dunkeld, than which a wetter climate could scarcely be pitched on. It has the useful property of killing the heather, and thus preserving land for cultivation, while that plant flourishes in a wood of the Scotch fir. Besides that the bark is half as valuable for tanning as that of the oak, the timber of the larch is reckoned superior to all other European and American Pines. Some beams in the palaces, &c. of Venice, are 120 feet long, and the Lib. of Ent. Knowledge, Timber Trees, affirms that a fishing boat, built of larch only 40 years old, has been found to last three times as long as one of the best Norway Pine; it is not so buoyant, however, nor so elastic, and it does not dry so completely as Pine; boards of it are more apt to warp. It is, however, much more tough and compact; and what are very valuable properties, it approaches nearly to being proof, not only against water, but against fire,* for before a larch beam can be even completely charred on the surface, one of pine or of dry oak will be in a blaze, beyond the ordinary means of extinguishment." *LARIX pendula*, the American black larch, also supplies a very excellent timber.

But it is, perhaps, premature proposing this or any other introduction till we have learned how it behoves the authorities in the N. W. Provinces to take immediate measures for counteracting and replacing the enormous yearly increasing, and often wanton and most improvident devastation and denudation, caused by the great demand for timber, firewood and charcoal. Whole hills, immediately beyond the magic circle of the station boundaries, are already bared, and even the cedar forests of Muhasso are considerably thinned, not so much by the felling of large trees, as by the pernicious custom of cutting down young ones for small spars, whereby the purchaser who has contracted for sound timber, is grossly imposed on.† Even at Simla great numbers of trees annually disappear, notwithstanding the regulations to the contrary; so that besides the injury to its beautiful scenery, it is

* This fact is noticed by Julius Cæsar, who calls the larch "ignem igni impenetrabile." It is, however, tacitly contradicted in the Rev. W. Bingley's "Useful Knowledge," where we are told that the very combustible nature of this wood renders it unfit for building purposes.

† Major Boileau calculates that there are not less than 300 saws daily at work on Muhasso. Let the supply from this mountain be once exhausted, and the glen of the Girree will prove an insurmountable obstacle to the forests beyond it being made available.

not unwarranted by experience elsewhere, to predict that if matters progress at the same rate as hitherto, a scarcity of water as well as of wood will be the result, from the augmented rapidity of evaporation consequent on the removal of the natural screen supplied by the trees. Many are calling for further clearing on the score of health, but if Simla be really less salubrious than formerly, the fault should rather lie at the door of increased filthiness, for the woods are unquestionably far less dense than they were; and, at all events, the charge cannot be substantiated against the trees, chiefly cedars; for it has been remarked, I believe justly, that where ever the Pine, &c. naturally flourish, there the climate is naturally healthy. The narrow leaves can scarcely check the circulation of the air; and they are too resinous to injure it by the decomposition. It is quite possible, that the asserted increase of fever may originate in too devoted a cultivation of the vine, the hop, and "inspiring bold John Barleycorn." There is indeed during the wet season a rank undergrowth of herbaceous vegetation, especially of a species of *Balsam*, against which let war to the knife be proclaimed. But not a tree should be touched; on the contrary, every open spot beyond the boundaries, and especially the denuded tracts on Muhasso and the Kussowlee range, should be sedulously planted. Surely as the Hill chiefs are so well paid for their timber, and have thereby materially increased their incomes, it would be merely an act of justice and foresight to our successors, and of politic kindness to the lords of the soil themselves, were "the paramount power" to insist on every spot bared by the wood-cutter being at once carefully replanted under the sanction of a heavy fine, or even confiscation in case of non-compliance, with special instructions for the seizure of all cattle found trespassing, and strict prohibition of the ruinous practice of burning the grass annually, by which great tracts of young, flourishing forest are destroyed. The cedar may be had in any number and of all sizes, for, like the other Pines, it seems to thrive best when growing as thick as the young trees can possibly stand. There have been some attempts made to replant Muhasso, but this fact has been lost sight of; and instead of at least a dozen, one young tree only replaces the old one, omitting to allow for the numerous chances against its ever reaching maturity, which not one in ten does naturally. At Kussowlee and Subathoo, where the demand for fuel is great and unremitted, augmenting in the winter when there is no addition to the growth of Timber, the want will, in a few years become a serious evil, and tend considerably to enhance the cost of maintaining a European Regiment there. The same remarks hold good also with regard to Jutogh.

III.—*PICEA*. The *Silver Fir*. Leaves flat and strap-shaped, marked below by two white streaks, one on each side of the midrib. They are arranged, nearly in two horizontal rows, one on each side of the branch as in the *Yew*; and the cones are erect, cylindrical with deciduous scales. The name comes from *Pix*, pitch, and is applied by Pliny to *Abies excelsa*, the Norway Spruce.

1.—*PICEA Pindrow*. The *Pinus Pindrow* of Royle, called *Thunera* about Fagoo and Shallee; *Koodrom* at Muteeana, *Kulrai Sutrai* and *Choor* at Kot Khaee, &c. *Tos* in Chumba, Kooloo and the districts across the Sutlej; but about Nagkunda, and generally in these districts, where it is best known, it is called the *Pindrow* or *Pindrai*. Royle says, it is sometimes called *Morinda*: a Joobul man told me it was known as *Chitrow* in his country, and in the Choor, simply

Ruho or *Row*. It is, I believe, the *Ragha* of Kumaon. Captain A. Gerard mentions the *Sungcha* Pine on the Shatool Pass, probably a misprint for "*Sungeha*," which I have heard used for this many-named tree.

The *Pindrow* is not found at Simla, and is rare near the road over Muhasso, though there are said to be woods of it in the deep glens to the North. It reaches a higher elevation above the sea, than even the *Smithiana* spruce, flourishing from 8500 to 12,800 feet on Kumuloree, Hutto, Choor, Kedarkanta, Changsheel, Puthurualla (the Urrukta of Royle and Fraser,) and in short, all ranges of similar height. It is, probably, the "*Black Pine*, a lofty tabularly branched tree," which Dr. Griffith found abundantly in Bootan, from 11,100 to 12,500 feet above the sea. The foliage is of the deepest green, almost black, the leaves 3 to 4 inches long, with acutely two-toothed ends; they are flat and originate all round the whitish stems, but dispose themselves into 2 horizontal rows, nearly as in the *Yew* (*Thona*) with which the natives of the lower mountains constantly confound it, and hence, perhaps, its name *Thunera*. In Loudon's Supplement, *Taxus Lambertiana* of Wallich is given as a synonym, from which it would appear, that Dr. Wallich also mistook it for a *Yew*, most likely from inspection of the branches merely, or Loudon may be mistaken, as he is decidedly, in stating the leaves to be of the "same color on both sides;" for they have two faint, white, silvery lines beneath, and in young plants on Huttoo mountain, I noticed them as well developed as in the *Silver Fir* of Europe; and Loudon is, perhaps, right in regarding the *Pindrow* as a variety only of *Picea Webbiana*. The word *Pindrow* alludes, I fancy, to its very peculiar mode of growth, tall and cylindrical, or slightly tapering, like the upright *Cypress*, or the Lombardy Poplar: the trunk attains a great girth and height; some on the Choor measure 20 feet round at 5 feet from the soil, and Loudon gives the height as 100 feet, which is certainly much under the extreme mark. The stem is densely clothed with short, thick, scrubby boughs, bearing little proportion in length to the height of the tree, and ending in a mass of flat, declining branches. The cones are deep purple and oval, according to Royle; to me they seemed rather elongated or cylindrical, but they only grow on the loftiest branches, are erect with deciduous scales, and therefore by no means easy to possess oneself of on a casual and hurried visit. The seeds ripen in September and October. The timber is reported to furnish good beams for walls and roofs, but like the Rai, rots and warps, if exposed to the rain and sun; and when split into planks, the section is extremely rough and uneven: in this form I saw it on the roofs of the out-houses at Nagkunda in tolerable condition, after 12 or 14 years' exposure; no objection was made on the score of difficulty in sawing. Dr. Royle says only that the timber is used in the construction of houses. Should experiment prove it worthy of notice, there are most extensive and splendid forests all over Huttoo, and its gigantic spurs, which would afford, for many years, a supply of the finest timber, with spars "fit to be the mast of some great admiral," when floated down by the Sutlej and Indus to the sea-coast.

2.—*Picea Webbiana*: *Silver Fir* of the Himalaya, the *Pinus Spectabilis* of Lambert, called *Chilrow* in the Northern Himalayas, according to Royle, also *Gobree*, *Smallur*, and *Oonum*, or the *Purple Coned Fir*, from the rich purple tint of the cones, which are said to be strikingly beautiful, and to afford an indigo, or purple pigment, whence, probably, the name *Salur*, which is that of *Boswellia glabra* or *serrata* in

Rajpootana. Captain Webb, after whom this fir is named, calls it *Oumur*, and it is, I believe, the *Raisalla* or *King Pine* of Traill's report on Upper Kumaon. Royle describes it as growing in the same situations as the Cedar and *Pindrow*, and also (Illustrations, p. 40) in Kunawur; but, so far as my observations extend, it does not form one of the trees on Nagkunda, Choor, &c., nor can I recollect on any occasion distinguishing it from the *Pindrow*, which Loudon seems to regard as a variety only of *P. Webbiana*. Fraser, in his tour in the Himalaya, frequently mentions the latter as perfectly resembling, in color and figure, the Silver Fir of Europe; specifying its slender, tapering form and short lateral boughs: but though he crossed Huttoo and many other mountains, where the *Pindrow* abounds, he never distinguishes it from the *P. Webbiana*. It appears, however, from Royle's Illustrations, that the leaves of the *Picea Webbiana* are only half as long as those of the *Pindrow*; have the two well-defined silvery lines beneath, and are obtusely emarginate, instead of being bidentate at the end; the cones, also, are cylindrical, and longer than those of the *Pindrow*, which are oval: young trees of *P. Webbiana*, which I saw at home, exhibited the two white bands beneath the leaves, even more strongly marked than in the European Silver Fir. Captain Webb describes it as growing 80 or 90 feet high, with a diameter near the ground of 3 or 4 feet; and Captain Raper, who wrote the narrative of their journey (As. Researches, xi. 546), gives 70 or 80 feet as the stature, and 7 or 8 cubits as the girth. They met it, for the first time, near Rameni, and the Nundakinee river in Gurhwal, where it appears to be called "Deodar:" Captain R. notices its tapering habit, and says the "leaves are about $1\frac{1}{2}$ or 2 inches in length, flat, sharply pointed, and produced horizontally on each side of the twig." In the volume, "Useful and Ornamental Planting," in the Library of Useful Knowledge, it is described as a most magnificent tree, resembling a silver fir upon a large scale; "nothing in the fir tribe can easily surpass in beauty this fine tree, whose silvery bark, bright green leaves, white beneath, and purple cones, studded with drops of transparent resin, render it an object of high attraction. Every exertion should be made to procure its cones." It appears to abound in Northern Kumaon. Fraser says the Timber is used by the natives in building; and Captain Webb describes it as used by plane-makers: and Mr. Aikin reports, "*Pinus Webbiana* from Nepal: exterior layers soft, and of no value: interior ones harder and finer grained." I have been informed, that Captain Jones, Executive Engineer in Rohilkhund, recommends it as a very strong wood: but I am not certain whether this or the *Pindrow* (*Ragha*) be intended. Subsequent experiments made by Captain Jones exhibited the Timber of the *Rai Sulla* as about equal to the worst specimens of Kumaon Cedar in direct strength; and very inferior to good *Cheel*. Vigne mentions, that in Kashmeer, the wood of "the longest species of fir," called '*Raya*' and '*Budel*,' is used for window-frames and roofs.

The European fir which approaches nearest to the *Picea Webbiana*, is the Silver fir, *Picea pectinata*, so called from the comb-like or 2-ranked arrangement of the leaves, which, however, is a character common to the genus as now defined: it is the *Abies pectinata* of De Candolle, and is supposed to be the *Abies pulcherrima* of Virgil. When Cæsar asserts, that neither the *Abies* nor *Fagus* grow in Britain, he must be understood to speak of the *silver fir* and *sweet chestnut*, or perhaps the *Quercus ballota* or *edible Spanish acorn*; for the

Scotch fir and the *beech* are unquestionably indigenous, the latter being found in its greatest perfection in the very districts visited by Cæsar. The *silver fir* grows to a great size, and has its English name from the bark, which is white in the young tree; and from the leaves about an inch and a half long, which have two silvery lines beneath. They are, however, of the darkest green above, and it is the preponderance of this tree which has given name to the black forest in the South of Germany; it is also common on the Alps, on Mount Olympus and on the Pollino, and the forest of Rubia, in the kingdom of Naples grows from 130 to 150 feet high. It is, I believe, the *sapin* of the French, the *fichte* or *tanne* of the Germans; but Loudon applies these names to the *Norway spruce*; and in April, when the ends of the branches are covered by the yellow and orange male strobile, has a very rich and beautiful appearance. The timber is softer and less durable than that of fir or larch, but is said not to shrink. It affords a greater quantity of resinous matter than any of the other firs. "The property of reproducing a leaning stem or branch when divided, common to all other trees more or less, is wanting in this family of trees," the *conifera*; and when cut down below the branches, they are incapable of sending out fresh shoots, and are destroyed beyond remedy: this fact had been observed in very early times, for we read in Herodotus, (Erato. 37 of Beloe,) that Croesus directed the citizens of Lampsacus to liberate Miltiades, "threatening on their refusal to destroy them like *Pines*." The silver fir, however, when so treated, though it never recover its leafy honours, has the singular property of not only continuing to live, but even of increasing in bulk, and of covering with bark the scar of the feller: this circumstance is said to have been established by more than one example on Mount Jura, and if correct, is not easily to be reconciled with the usual theory of vegetable physiology, which assumes the leaves to perform an essential part in the elaboration of the sap, and the growth of the tree. Captain Young, Royal Engineers, says, "I have seen stumps of Hemlock (spruce) in the Nova Scotia woods that have survived their upper portions for forty years." (Professor Papers, v. 116).

Strasbourg turpentine is produced by the silver fir, common and *Burgundy pitch* from the *Scotch fir* and *Norway spruce*; *Bordeaux turpentine* from the *pinaster*, and *Venice turpentine* as well as oil of turpentine from the *larch*: and *Canadian balsam* from the *Picea* (old *Abies*) *balsamea*, or *balm of Gilead fir*. *Amber* is believed to be the fossilized resin of a pine; and the *surturbrand* of Ireland and Antrim, a jet black mineralized bituminous wood, found in layers in lava and basalt, is supposed to be Pine.

Douglas discovered two majestic species of this genus in North California or new Albion, one, *Picea grandis*, growing in the vallies to the height of 200 feet, with wood soft, white, and of inferior quality; the other, *Picea nobilis*, nearly as large, growing on the mountains with wood of excellent quality.

IV.—*Cedrus*. Leaves in tufts of from 40 to 50; evergreen, cones solitary, erect with deciduous scales: the larch (*Larix*) has also the leaves in tufts, but they are deciduous or fall in winter; while the cones, though erect, have persistent scales.

The word *cedar* in Greek, *kedros*, is probably derived from the Arabic *kadr*, worth, value, or its derivative, *kudrat*, strength, power, in allusion to the value of the wood: the Hebrew and Arabic names are *erez* and are from the Arabic root *araza*, he was firm and stable with roots deeply fixed in the soil (Goliuv.) There is not, I imagine, any affinity between the

name *cedar*, and that of *kedarnah*, *kedar-kanta*, *kedar-patri*, (the latter is the *LIMONIA laurolela*) found in the Himalaya, though in a paper by Lieutenant E. Conolly, in the Journal of the Asiatic Society for October, 1837, I see the title of *Siva Kedareswara* rendered, 'lord of cedars,' and again 'lord of the mountain stream,' which latter agrees with Traill's etymology of Kedarnath, 'lord of the abounding stream,' from the Sanscrit *ke* water, and *dar* abounding, a derivation true both in nature and fiction, since the Ganges is feigned to fall from the heaven of Vishnoo (the clouds) on Siva's head, whence it trickles on earth through his locks, which in this case denote the icicles, &c. of Gun-gautree.

1. *CEDRUS deodara*. The Cedar tree of the Himalaya called *Kelou*, *Keloo* and *Keoulee*, about Simla: *Kelmung* in Kunawur, and *Geum* by the Thibetans: this is nearly the 'Kee' of the Goorungs. *Dedoor* and *dewar* by the people of Gurhwal, Kemaon, Nepal, Kashmeer and Persia. Roxburgh, who named the tree, says *Devadaru* or *Deodar* is the name the tree is known by amongst the natives where it grows, i. e. the mountains North of Rohilkhund according to his information; that of the Penny Cyclopædia comprises a ludicrous amount of error, considering the origin of that generally admirable compilation under the auspices of the Society for the Diffusion of Useful Knowledge; for there we are told that this 'Sacred Indian fir' is "a native of the mountains of India, near the town of Rohilkhund, on the Alps of Nepal and Thibet, at a height of 10,000 or 12,000 feet, and also in the woods of Almorah."

The Cedar was introduced into England by the Hon'ble Mr. Melville, in the year 1822, in which also was built the first house at Simla. Captain Gerard, however, informs me, that he had sent seeds home as early as 1819: the tree appears perfectly hardy in England, and is now to be seen flourishing in many Botanic Gardens, Parks, &c.: there is a fine young specimen, about 16 feet high, in the Chiswick Garden. In the Himalaya, it occupies a great vertical range, flourishing from about 5,500 to 12,000 feet above the sea, frequently mixed up for the first 1,500 feet with the *PINUS longifolia* and *QUERCUS lanata* (*Ban*); while for the last 3000 or 4000 feet it accompanies *ANISE Smithiana* and *PICEA Pindrow* to their elevated sites, beyond which, we meet no trees but the *Bhoj puttur* (*Birch*) the *Kurroo* or *Kurshoo* oak (*Q. Seme-carpifolia*, much stunted;) *Præus lanata* resembling the *white beam* tree of England, and another like the mountain ash; the shrubby *Potentilla*: the creeping *Rhododendrons* and *Juniper*, and highest of all, a *Dwarf Willow*.

To see the Cedar in its perfection, one must visit the Snowy range and the lofty mountains of the interior, far from the influence of the plains, and where, for nearly half the year, it is enveloped in snow; there its dimensions become gigantic, and throw into the shade, even the fine specimens by the Annadale and Southern Cascade Temples below Simla. Between Nachar and Turanda, in lower Kemaon, there is an extensive forest of very fine trees (also with a temple), from 20 to 27 feet in girth, and near this last village, Captain Pepper and myself in 1830, measured one 36½ feet in circumference, fully 5 from the soil: and on a subsequent journey, I saw several on the Northern declivity of the Boorun and Roopin Passes, not under 30 feet in girth, and from 150 to 200 feet high. Captain A. Gerard notes some of these as being 33 feet round: and one at Soang of 30 feet. Captain P. Gerard measured one at Barung 34 feet in girth, at 4-6 feet from the ground;

Pilgrim (Mr. P. Barron) mentions the "Cedar fir" of Tongnath mountain, above Ookesmuth, as 25 feet in girth, and upwards of 200 in height: and on the Toogasee mountain, on the route to the Neetee Pass, Moorcroft measured one which had fallen, 159 feet: another was 180 feet high, and 18 cubits in girth at 4 feet from the ground. Many on the Choor are 26 feet round, 5 or 6 feet from the ground: it is very probable the largest have not yet been met. Maundrell in 1660 measured one of the Cedars of Lebanon $36\frac{1}{2}$ feet in girth, which De Candolle believes to have been then about 600 years old: and if his calculation be admitted, some of our Himalayan specimens may be 1000 years old.

The Cedar is found on all the higher mountains from Nepal up to Kashmeer; and Dr. Griffith describes it as occurring "in vast abundance and size" on the Sufaid Koh and Texeen Ranges, as well as those of Olipore, near the head of the Koonur Valley, towards Kafiristan; where it is called *Nokhtur*, and flourishes at from 6,500 to 10,000 feet above the sea. Dr. G. has, I understand, asserted that he could not detect any distinction between the fruit and seeds of the Lebanon and Himalayan Cedar; and it would be curious, and tend to establish their identity, if the tree could be traced in a continuous line from Afghanistan along the mountains of Persia, to Mount Taurus in Asia Minor and Lebanon. These last two mountains are of limestone, while the *Kelou* seems to avoid the limestone ranges of Budraj, Mussooree, the Kurol, and Soorkunda; and to the best of my recollection, does not grow or at all events abound, on the limestone mountains East of the Tones river; but this may arise from other causes, such as the proximity of the plains: it occurs, however, on the Gagur range above Bumouree. Major Harris incidentally alludes to a Cedar "which graces the Alps of Northern Abyssinia."

The *Cedar of Lebanon* (*CEDRUS Libanotis*) attains a considerable size in many parts of France and England, and is supposed to be more abundant now in the latter than on Lebanon itself, where Solomon's 80,000 hewers must have committed no small havoc. Very fine specimens exist at Cheleea, at Sion House, near Richmond, in Richmond Park, and one in the Jardin des Plantes at Paris was, I believe, planted by Jussieu. They are all remarkable for their huge, wide-spreading arms, and tabular branches, and except in the extremely dark green of the foliage, seemed to me identical with the *Kelou*. The cones are perfectly similar, and grow in precisely the same manner. Scientific observers, however, who have compared the two trees together in Europe, consider them to be quite distinct. The *Kelou* is said to differ by having its cones upon stalks (which I have not observed to be the case), and by its leaves being longer and more distinctly 3-sided: by its producing great quantities of turpentine and tar, and its very fragrant, fine-grained, and durable wood; while Loudon pronounces the Timber of *C. Libanotis* to be coarse-grained, perishable and inferior to the worst English deal: the Penny Cyclopædia says it "produces deal of very indifferent quality;" and the British Cyclopædia agrees that the Timber is "far inferior to the common Scotch Fir." It has accordingly been doubted whether *CEDRUS Libanotis* be the true Cedar of the ancients; but we must recollect, that while the *Kelou* is tested by the qualities it possesses on its native mountains, the experiments on the Cedar of Lebanon are carried on with specimens very probably grown in the rich alluvial valley of the Thames, where the trees have to "contend with conditions differing much from those to which nature

had originally submitted them;" and that the timber may very well be as inferior to that from the rocky heights of Lebanon, as that of the Scotch fir grown in the low lands and stiff clays of England is known to be, compared with the same timber from the Scotch and Norwegian mountains. The want of turpentine and tar may be accounted for by its removal from a very elevated to a very low site, for the Psalmist specially notices the Cedars of Lebanon as being "full of sap:" and to obtain a just estimate of the comparative value of the two Cedars, and thereby a means of deciding whether, so far as the test of timber extends, they are specifically distinct, samples of wood should be imported from Lebanon and Taurus. Virgil notes the wood of the Cedar as being particularly adapted for houses; and it is not likely that Solomon, who, among his other acquirements, is said to have been a Botanist, would have selected so perishable a material for his Temple, which in fact lasted about 500 years, and was finally destroyed by fire, and not by natural decay.

The *Kelou* preserves the characteristic habit of huge horizontal boughs, clothing the trunk nearly down to the ground, with all the lesser branches on the same level. When planted in thick groves, the tree grows erect, in a spiral form, with shorter lateral boughs; but when solitary or in clumps on an exposed knoll, or when the leading shoot has been injured, the branches spread horizontally to a great extent, with a flat tabular summit, quite resembling the Cedar of Lebanon, and so unlike its more ordinary form, that many are led to think it must be a different species. In young trees also the boughs sometimes droop, sometimes ascend, and we may, occasionally, observe the branchlets so short, and pendulous, as to give the tree more the appearance of the Cyprus than Cedar; and this also has probably been the reason why travellers have supposed there were two distinct kinds; but the Cedar of Lebanon, even in England, varies in exactly the same manner: some growing in a conical shape, some with a great shadowy head, and others with several stems, so as to form a vast bush. This last peculiarity is very observable in many of the *Kelou* trees at Simla: where broken off, or cut down, while young, a few feet above the ground, it has the power of throwing out upright branches; or, the horizontal ones change their direction to the perpendicular; and hence, we often see a tree with half a dozen stems of considerable size, each furnished with its portion of lateral branches: this tenacity of life is, I think nearly peculiar to the Cedar. Burkhardt notices, that the oldest trees on Lebanon have from four to seven trunks springing from one root.—(*Travels in Syria*.)

The leaves of the *Kelou* are from 1 to 2 inches long, and except on the leading shoots, where they are scattered, (as in *ABIES*,) are collected into tufts of from 30 to 60, on very short and numerous branchlets; these tufts are not bound by sheaths into fascicles, as in *Pinus*: and Lindley ingeniously observes, that in the Larch, as well as the Cedar, they originate in the non-developement of branches; for, once the branch commences growing, the leaves of the tuft are, necessarily, scattered: on young trees, the leaves are of a bluish green tinge, and the general aspect of the tree is exceedingly graceful, but as it grows older and larger, the color deepens through various shades of bright into a dark green, and the branches assume a stiff and solemn appearance. It flowers in September, and the seeds are ripe in all October and November, requiring above a year to come to maturity. The male catkins, though solitary, are very numerous, erect, 2 to 3 inches long,

and abounding in yellow pollen : they are, at first, oval ; but gradually become cylindrical. The majority of the trees have these, and the seeds bearing cones on separate plants ; but a considerable number of trees are monœcious, i. e. have both male and female strobili ; the cedar of Lebanon is, also, both monœcious and diœcious. The cones are erect, thick, nearly cylindrical, about 4 inches in length and diameter ; and as soon as the seeds are ripe, they break up, and both scales and seeds, fall to the ground, as they do in *Pinus*, which has also erect cones.* This appears to be a very remarkable provision of nature, as from the position of the cone, were the scales persistent, the seeds could never fall out ; while, in the genera *Pinus* and *Abies*, where the scales are persistent, and the cones remain long on the branch after the seed is ripe (above 20 years, it is said, in *Pinus pungens*, a species found in Virginia and North Carolina) the cones are pendulous, and the seeds drop out only too readily for those who wish to collect them in any quantity. In the Larch, this adaptation of means to ends may appear lost sight of, as the cones are erect, the scales persistent, and the seeds so difficult to extricate, that the planter is forced to apply gentle heat in a kiln, and then thresh the cones, but in effect the branches of the larch are so pendulous and flexible, that the erect position of the cone becomes of less importance, and a gale of wind must speedily disengage the seeds from the small cones as soon as they are perfectly ripe.

It has also been supposed by those who search for final causes (a search which Lord Bacon says is fruitless, like a virgin dedicated to God,) that the cone-bearing trees are furnished with their *acerosæ* or sharp, slender leaves, to enable them to endure without injury the brunt of the snow and storms of winter, which other trees avoid by casting their leaves ; the idea is ingenious, and might be true were it general, but the fact is, that many of these trees are indigenous, where snow seldom or never falls, so that the enquiry seems to lead us into the blunder of the old gentleman, who observed the kindness of Providence in its having so ordered the course of great rivers, that they should run by great cities.

About a month after the cedar has flowered, we may perceive the young cones covered with a bluish bloom of a cylindrical form, sessile and solitary on the tuft of leaves. The mature seed is excessively resinous, and has a deltoid, straw-coloured wing, about an inch long, and the same width at the end. There is a bird at Simla (probably a species of *Loxia*) which devours the embryo of the *Kelou* and *Cheer* in spite of the turpentine by which it is surrounded. The embryo is very large, green, with ten or eleven cotyledons or seed-leaves, and quite resembles a miniature tree, except that the leaves are all in one whorl.

Whether imported or sent to Europe, all possible despatch should be made with pine seeds, for like other resinous seeds, these are perishable, unless sown within a few months after the cones have been gathered. They preserve better in the cones ; and in either case the box containing them should be kept in an airy place on board ship, and on no account put into the hold. With respect to the Cedar of Lebanon, however, Loudon states that the cones, which are imported from the Levant, should be kept for a year, at least, before it is attempted to take out the seeds, which he adds, will retain their vegetative powers

* Roxburgh's description of the cedar is very imperfect, and decidedly erroneous, where he states the scales of the cones to be so close as to prevent the escape of the seeds without help.

for many years. The cones of the *Kelou* fall to pieces when ripe. He also states that the cedar of Lebanon is very impatient of pruning; the *Kelou* appears to flourish, however mutilated. These differences add to the probability of the trees being specifically distinct.

The *Kelou* is the *Larch* of Fraser and other Himalayan travellers, and is still occasionally called so at Simla; it differs essentially, however, in being an evergreen, and in its large cones with deciduous scales; the cones of the larch are not above two inches long (with very small seeds), and when young, are of a beautiful crimson in one variety, and of a peagreen in another, and each scale has a large bract which is not seen in the *Kelou*. The foliage is disposed in tufts, but is of a bright yellowish green in the larch, becoming ruddy in autumn before the leaves fall. Fraser, more than once, enumerates "two sorts of larches" in these mountains, especially in Bulsun, and between Choupal and the Girree, one evidently the *Kelou*, the other "differing in colour and in the tufted appearance of its leaves, but the tree retained its character." Captain A. Gerard also distinguishes on Huttoo "a species of Larch" from the *Kelou*; and in Mr. Walter's Section of the Khasya Hills (As. Res. xvii) I observe Fir and Larch trees marked about Nungklao. Lord Macartney's embassy found "the towering larch common on the mountains in China, in latitude 30°, where its wood is in much request for building, and Dr. Griffith fell in with a true larch in Bootan; and an undescribed pine is said to grow on Deobun, between Simla and Mussoorie. The *Kelou*, however, has so many modifications of form and colour, depending on age, elevation, exposure, and perhaps on sex, that I am inclined to resolve Messrs. Fraser's and Gerard's larch into one of these or even some other known pine; for Dr. Griffith observes that near Tussangsee in Bootan, *Pinus excelsa* has "much the habit of a larch," and in another place he speaks of *Abies Smithiana* as "an elegant larch-like species of pine." The sites, however, noted by Messrs. Gerard and Fraser, deserve a careful investigation.

The timber of the cedar is held in the highest estimation in the Himalaya, being considered almost imperishable, and peculiarly exempt from the attack of worms and insects. It has the advantage of requiring little or no seasoning, takes the saw kindly, but will not split into planks. Its only defect for building purposes lies in its being extremely inflammable; and on this account brands of it are often employed as torches. In the walls of temples in Kunawar, beams were pointed out to me, shewing no signs of decay, except being a little charred and blackened on the surface by the action of the sun and weather; and these temples were said to have been built from 600 to 800 years ago. This is probably an exaggeration, but Captain P. Gerard lived in a house at Summerkot, between Rooroo and Rampoor, the property of the Busehur Rajah, and ascertained to be 200 years old, in which the timber was as sound as the day it was cut. It is in great request for the walls and roofs of temples and houses, and for granaries, chests, and other purposes, where the ravages of insects, &c. are apprehended.

Mr. Aikin's report is singularly meagre; he is contented with "Pinus Deodara: Himalayan cedar from Nepaul; wood very fragrant," which is just the degree of information Virgil gives us, where he mentions the "*Olentem*" and "*Odoratum*" *Cedrum*; every house at Simla proves the truth of these epithets; after residing in one of them for six or eight months, my trunks acquired its odour, which was frequently remarked in Europe. The Penny Cyclopædia, after noting its

extremely durable wood, uninjured in temples from 200 to 400 years old, says that Moorcroft obtained specimens from a bridge in Ludakh, where it had been exposed to the water for nearly 400 years, and was still sound.* There is a slight error here: the bridge in question is over the Jelum at Kashmeer; Moorcroft's words are, "The most valuable tree of Kashmere is, however, the *Deodar*, a variety of Cedar, the timber of which is extensively employed in the construction of houses, temples, and bridges, pieces of it from the Zein-ul-kadal bridge were found little decayed, although exposed to the action of water for four hundred years." Travels II, 152, at page 121, he describes the great Jumma Musjid of that city, built by Aurungzebe, as almost entirely constructed of Cedar; "Such also, is the durability of the Timber of the *Deodar*, that in none of the columns was any vestige of decay from exposure or insects to be discovered, although they have been erected above a century and a half, and have received for some time past very little care or attention." Mr. Vigne follows on the same side, and tells us that in Kashmeer, "bridges, boats, and musjids are built of the imperishable *Deodar*."

In the Journal of the As. Soc. of Bengal, for July 1833, in the notes to "The Birth of Uma, a Legend of Himalaya, by Galidasa, translated from the Sanscrit by (I believe) Dr. Mill, then Principal of Bishop's College, the word *Devadaru* is rendered Cedar, the "*Pinus Deodara* of Dr. Roxburgh, and which, as Dr. Wallich informs me, is very nearly allied to the Cedar of Lebanon. * * * Its wood is very hard and durable, retaining a lasting fragrance; the turpentine extracted from it far exceeding other kinds in scent: a full account of the tree (though not a good drawing) is given by Mr. Lambert in his splendid work on Pines." It appears from these notes, that in Nepal, the Cedar does not occur at a less elevation than 10,000 feet above the sea, which coincides with the statements of Goorkhalees of the Nusseeree Battalion.

From Mr. Mines I have received the following notice of the Cedar wood:—"It has a peculiar and strong odor, so that no insect will touch it; the grain is open and straight; it is not liable to warp, even in thin boards exposed to all weathers, and may, in a word, be considered the best wood of its class in the world. Like all other woods, if cut young, it will soon decay, when in contact with mineral damp." It is said, however, to be inferior to the *Cheer* in resisting pressure at right angles to the fibres; but good experiments on the comparative strength of the Himalayan woods, especially, are still a desideratum; some are in progress under the superintendence of Major Abbott, Engineers, and the following numbers shew the result of recent trials by him; but many more are requisite, before any safe conclusion can be drawn: the numbers give the ratio of direct strength of Simla specimens:

Koel 363,

Cheer 593 picked specimen: a ditto from Kumsoon gave

458,

Rai. 565,

* The wood of the *Alder*, felled at midsummer, is reckoned in England very durable under water; we have a species (*ALNUS obtusifolia*) abundant in these mountains, fringing the banks of the Fabley, Roopin, Tons, Jumna, &c. from 4000 to 6000 feet above the sea, which would probably be equally useful in similar situations, the tree is called "*Cheelons*," near Simla, as is also the *Poplar* (*Populus Chitata*.) Lindley says the wood of *Pyrus aria* is "invaluable for Axle trees," a very similar species, *P. lanata* called *Patloo* or *Bun Pultee*, is abundant, and grows to a large size at Nagkunda, Huttoo, &c. &c.

Keloo, 469: but a picked specimens from Kumaon, 6 or 7 years old, gave 760: shewing the wood in this case to be stronger than the best *Cheer*: from experiments carried on in Europe, it appears that very different results are sometimes obtained from specimens derived from the same tree.

The bark of the Cedar is, occasionally, employed in roofing huts, and the leaves are also given to cattle: Dr. Royle mentions that they and the young twigs are much used in native medicine. But after its timber, the most valuable product of this tree is its turpentine, called *Kolou ke tel*, "small, split pieces of the wood, prepared for the purpose, with smothered heat, produce a useful oil; of the odor of the wood, but which has not been brought to the consistency of tar." (Mr. Mines) It is "much valued in upper India as a stimulating application to foul and indolent ulcers;" is an excellent remedy for mange in horses, and for sore feet in cattle. It is, probably to this, that Horace (*De Arte. Poet.*) refers, "Carmina linenda Cedro, et lævi servanda cupressæ:" and Pliny, XVI. 39, "Cedri oleo peruncta materies nec tineam nec cariem sentit." Captain A. Gerard affirms, that when rubbed on any other kind of timber, it renders the wood less liable to decay and the ravages of vermin. Shakspeare has remarked, "A Tanner will last you nine years, because his hide is so tanned with his trade, that he will keep out water a great while; and your water is a sore decayer of your whoreson dead body," whether in the genus *Homo*, or *Pinus*; and it would really be worth testing whether "extreme unction" of *Cheer*, *Kail*, and other perishable wood might not tend to their preservation from dry rot, worms, and the ruinous effects of damp.

The fair long branches, numerous, thick boughs, shadowing shroud, and exalted height (*Ezekiel xxxi.*) of the Cedars of Lebanon, appear to have exercised pretty much the same influence on the imagination of the Hebrew Poet, as the *Deodar Cedar* continues to have on the minds of the Himalayan Mountaineers, and in former times on those of the Hindoo Poets. In the one we read of the "goodly Cedars," "The Cedars of God" "excellent as the Cedars," &c.; in the other we find the tree designated *Devadara*. "Tree of God:" the temples constructed of its timber, are, unless perched on the bare summits of the mountains, almost invariably shrouded in lofty groves of the *Kelou*, of which the sombre color, dense foliage, and serried stems produce very nearly the "dim religious light" and other solemn effects of our Gothic Cathedrals, with their majestic apparatus of clustered column, and endless pointed arch. The tree is unquestionably held in considerable veneration, and I have been informed by the villagers, that they do not much relish using the timber in their houses, when any other is procurable, for fear of incurring the displeasure of *Debee*, who is its supposed patroness. Near *Muteeana*, they point out a temple of the great goddess: and while the *Ghoorkhalees* kept a garrison there, I was told that they felled two of the trees of the sacred grove: the sacrilege was forthwith punished by a pestilence, which carried off two *Sirdars* and a host of inferior men; nor did it cease till the angry goddess was appeased by the offering at her shrine of two miniature Cedars in gold. I record the legend merely to prove that the *Kelou* may very well be the true *Deodara*; for during these last ten years, a kind of Trojan war has raged at *Simla* between the Botanists, and certain members of the Society, practically well-informed as to the names of the *Coniferae* of these provinces, who maintain that the former have committed a palpable error in identifying the *Kelou* and the *Deodara*:

and some of them are still strongly tempted to deny the *Kelou* its pretensions to be a Cedar at all. The resemblance however was noticed very early; Captain A. Gerard wrote many years ago, "The Keloo seems to be either the Cedar of Lebanon, or something very like it." Colonel Hodgson twice identifies them (As. Researches XIV. 65. 112.), and as long ago as 1812. Moorcroft repeatedly admires the fine forests of "Pine, Cedar, and Cypress, by Josheemuth on to the Neetee Pass:" by Cedar he means the *Deodar* or the *Kelou*; and by Cypress, either the *CUPRESSUS torulosa* or *JUNIPERUS excelsa*: and yet his editor (As. Res. vol. XII.) always corrects Cypress by Pine in his notes. Colonel Hodgson notices the splendid forests of Cedars between Sookhee and Bhairoo Ghattee; but unless his "high feathery Pines" be the Juniper or Cypress which abounds there, he has not discriminated them. He tells us that at Bhairoo Ghattee, "The great Cedar Pines, those gigantic sons of snow, fringe these bare rocks, and fix their roots where there appears to be very little soil," which is exactly the position affected by the Tree Juniper in Kunawur. Bishop Heber describes our Cedar as "a splendid tree, with gigantic arms, and dark narrow leaves, which is accounted sacred, and chiefly seen in the neighbourhood of ancient Hindoo Temples, and which struck my unscientific eye as very nearly resembling the Cedar of Lebanon." In fact the doubt is now whether it be actually a different species. What remains is a question of words and names, which, if not very important has the merit of being very easily solved: it is, whether Dr. Roxburgh was justified in imposing on the Cedar the specific title *Deodara*? It is true beyond doubt that this word, as used by the mountaineers all about Simla, designates not the *Kelou* or Cedar, but the Cypress, and also the red Juniper wood, brought down from Kunawur, strongly resembling the common pencil wood "hitherto called (or miscalled) by us Cedar" (Colonel Hodgson,) both of which are burnt as incense to the gods; and this popular, but erroneous application of the term *Cedar* to the produce of an American and Himalayan Juniper, has probably tended to mislead some, and induce them to deny the *Kelou* to be a Cedar. Dr. Royle however clearly specifies "the Himalayan Cedar-wood, *JUNIPERUS excelsa*, found on Gosainthan (in Nepal,) in Kumaoon, and on the confines of Tartary," and hence Botanists cannot be justly charged with ignorance of its existence, and the difference between it and the Cedar tree. They were perfectly aware that the Cedar of Solomon's temple was the produce of the *CEDRUS Libanotis*, nearly allied, if not the same as Keloo: and that the red wood of Kunawur, and of our black lead pencils, also called cedar, is yielded by the *JUNIPERUS excelsa*, *Bermudiana*, and *Virginiana*. The name *Deodara* is very vague, nearly as much so as cedar, which in the West Indies is also applied to the produce of a species of *CEDRELA* or *Tuon*; while in Bengal *Deodara* denotes the *GUATTERIA longifolia*, quite a different tree from any of the *Coniferae*, though it has somewhat of their erect spiral habit. Even in the Simla mountains, the true vernacular name of cypress is *Gulla* or *Gulain*; and of the red-cedar-wood or Juniper, *Nawur Shookpa* and *Shoor*; the term *Deodar* being wholly unknown in Kunawur. It is, at the same time, equally certain that it is applied in Gurhwal, Kumaoon, and Nepal to the *Kelou*; and hence as this tree first became known to us in these quarters, it was not improperly called *Cedrus Deodara*. Mr. Traill always uses the name *Deodar* for the *Kelou* in his reports on the Kumaoon, and Dr. Falconer assured me it is known by no other name to the Persians and Kashmerians."

Messrs. Moorcroft and Vigne always mention the tree as so called in Kashmeer, and the latter even makes a nice distinction—"near the town (of Kishtawur) on the northern side, is the finest *Deodar* (or, as it is here called *Devidar*), or hill-cedar, that I had ever seen." Travels I. 205. Avicenna, who flourished at Bokhara above 800 years ago, defines "*Deodar*" thus, "Est ex genere *Abhel* (JUNIPERUS) quæ dicitur pinus Indæ; et syr deodar est ejus lac." Now as neither the cypress or juniper yield any turpentine, it appears that the *kelou ke tel* must be intended, and that the tree which produces it must have been known as the *deodar* to the northern nations above 800 years ago, and is so to this day according to Dr. Falconer; this is equally true of Gurhwal; Colonel Hodgson (As. Res. XIV. 112,) says, "The *deodar*, or as it is called to the westward, the Kailou;" and at page 112, "the *Deodar* or Cailow Pine, which I suppose to be the Cedar of Lebanon, is the largest, most noble, and durable of all trees;" on which Dr. H. H. Wilson remarks in a note, "It is the *Pinus Deodara* of Roxburgh; the *Devadaru* of Sanscrit writers." The Penny Cyclopædia says, "according to Mr. Moorcroft, from whose notes in Mr. Lambert's Monograph of the genus we borrow much of our information, the Hindoos call it the *Devadara*, or god-tree, and hold it in a sort of veneration;" which is followed by Loudon in his Supplement. Captain Raper (As. Res. XI. 468) says, "near the temple of Bohan Devi, stood a fine spreading fir of the species which the natives call *Deodar*;" but he afterwards applies the same word to another species, probably the *Pindrow*, and tells us, lastly, that "*Deodar* is a name which the natives of Gurhwal indiscriminately apply to all the different kinds of firs." Never having been myself in these countries, and desirous to have personal proof on this matter, Captain O'Brien had the kindness to select some intelligent men, of the Nusseree Battalion, from Gurhwal, Kumaon, and Nepal, who all, without hesitation, assured us the *Kelon* was only known as the *Dewar* and *Deodar* in their country; and that the Cypress, the *Deodar* of Simla, was there called *Soorys*. Their statement hardly bears out Captain Raper's of the vagueness of the term "*Deodar*;" on the contrary, I was distinctly informed that *P. excelsa* is called *Chilla* in Gurhwal; and *P. longifolia*, *Kholain*; while in Kumaon and Nepal, the latter is known as *Sulla*. Dr. Mill must have had Dr. Wallich's sanction to his translation of Cedar for *Deodaru*; and on the whole it appears to me there is no just cause for objection to the "*Cedrus Deodara*" of Botanists. The specific term can only be altered now to *Libanotis*, should the tree be found identical.

Calidas's notice of the *Deodar* is connected with Gungautree:

"Its snowy white way,
Down dizzy heights plunging great Ganges' young river
Full darts its precipitous torrent for ever,
Or shaking the fragrance of tall Cedar trees," &c.

Every one must have perceived the fragrance of the Cedar on passing through the forests of Muhasoo, &c., and perhaps the Biblical commentators had better explained "the smell of Lebanon" by a reference to its Cedars than to its wines; but critical honesty compels me to avow that as either the Cypress or the tree Juniper (I am not certain which) grows in perfection and abundance towards Gungautree, Buddreenath, Keedarnath, &c., the poet may have intended it rather than the Cedar. The general opinion among the natives appears to be, that the *Deodaru* of the Shastras is the JUNIPERUS *excelsa*; and it would be worth ascertaining to what tree the Brahmins at the above holy sources apply

the term, as tradition may have handed down to them more correct particulars than exist elsewhere. At the same time it must be admitted these reverend men are probably bad botanists; at least they seem to have satisfied PILORUM that what in all probability is a fine species of FRITILLARIA at Kedarnath, was nothing less than a genuine LOTUS. The druggists of the Simla bazaar sell the red Juniper wood of Kunawur as the true *Deodar*; and tell me it is known as such, and used for incense over all Hindostan.

I have referred above to the veneration in which the Cedar is held by the Hillmen; and to the fact that the Temples of Debee are always embosomed in its groves; but Debee is the same as Parbuttee, and this "mountain nymph" is the mythic daughter of Himalaya. Dr. Mill extracts a story from another poem by Calidas, relating how Parvati adopted one of these "Devadaree Cedars," and nourished it as her own daughter; and which, when damaged by an elephant, had, at her instance, a guard placed over it by Siva, in the person of his servant, "turned for that special purpose into a fierce lion." Does not the actual association of Debee and the *Kelow*, probably received by tradition from ancient times, tend to shew the latter to be the tree intended by Calidas, and that Professor Wilson is correct, especially also when we find that in Kishtawur the tree is still known as the *Devidar*.

It is a curious coincidence, that Virgil styles the Pine "*Sacra Pinus*," which the commentator explains "*sacra magnæ deorum matri Cybele, propter amicum Atyn in pinum commutatum*." Cybele and Debee may be considered as identical; and Atys was the Phrygian Apollo, perhaps, from *atush*, fire; fabled to be commuted into a pine on account of its combustible wood. Richardson also gives "*Deew-awurd*," or the "spirit-bearer," as a Persian appellation of the Pine; and *Deevdal* as the Persian for the Poplar, probably from its trembling leaves.

It is to be regretted that Dr. Mill never published, so far as I know, the completion of Calidas's Poem, abounding, as it does, in allusions to the scenery and natural productions of the Himalaya. Some of these Dr. Mill treats as fabulous, as for example, the reference to the *Jyotis Mati*, or "*Luminous Plant*," of which he considers the *CARDIOSPERMUM halicacabum* as the equivalent; but which has no known luminous property; unless there be supposed a far-fetched allusion to the white heart marked on its black seed: but why not admit that the ancient Hindoos, better instructed as they evidently were than their descendants, had observed the curious phenomena of the *DICTAMNUS fraxinella*, which generates an inflammable vapor that has several times been observed in combustion in Europe? An allied plant, the *DICTAMNUS Himalayensis* of Royle, grows about Jumnotree, Cheenee in Kunawur, and no doubt many other places in these mountains; and the numerous Pilgrims to the sources of the sacred rivers may easily have remarked and communicated the fact: or the *Tuberosa* (*POLIANTHES tuberosa*) may be the *Luminous Plant*; for it has been observed of a sultry evening, after thunder, when the atmosphere was highly charged with electricity, to dart small sparks of lucid flame in great abundance from such of its flowers as were fading; and this is a favorite flower in Indian gardens. Pliny mentions the *Nyctigretum*, a plant of Gredrosia, as having luminous roots when dry; and Ælian ascribes the *Lunaris* and *Aglao-phytis*, which last seems a translation of *Jyotismati*. The injudicious Josephus (war, B. 7.) gives us a ludicrous relation of the wonderful properties of a plant found near Machairus, and of the precautions to be taken in gathering it: for it was sovereign for the

expulsion of demons, but, in some particulars, it agrees with the above: "its color is like that of flame, and *towards the evening* it sends out a ray like lightning; it is not easily taken by such as would do it, but recedes from their hands like the sensitive plant. Perhaps many of these apparently incredible stories are founded in fact: thus, the fable of the Upas tree is a jumble of the properties of a really very poisonous tree with the equally deadly effects of a deep valley, charged with the carbonic acid gas, both in Java. When Captain James Abbott was at Khiva, the Khan asked him, "have you ever seen Bab-ul-mandeb, where an angel stands whirling a fiery sword?" and the Envoy replied, that he had never heard of the Angel: but the truth is, that till within these few years, an active volcano flamed on the Arabian shore of the Strait, and was held in much terror by the native seamen; and as late as 1835, the islet called Jubul Tyr, 900 feet high, and only a little within the Strait, was also an active volcano: and as "distance lends enchantment to the view," by the time the knavish or credulous pilgrims from Mecca had reached their homes in Khauriam, the flaming crater was transformed into an angel of light, armed with a fiery sword. I have heard Irish heretics ridicule the Catholic miracle of Saint Patrick heating an oven with snow: but if the Saint had the wit to store it well beforehand with quick-lime, the thing was feasible enough.

Dr. Mill also mentions the plants *Sunfeevunce* and *Visulya kurun*, whose juice could revive the dead: the Shastras also speak of the *Kalpa birch*, or tree that grants all desires; and of the *Umur phul*, which made Raja Bhurtri immortal; but what these may be in the nomenclature of Linnæus and Jussieu, must be left to the researches of future travellers, with the remark that the *Visulya kurun* will be recognised by its yellow leaves, its red and golden flowers, and the millions of *Grandharvas*, *Rakshasas*, and others, who jealously guard this tree of life. Of the true one, Horace Walpole observes, that not even a shoot or sucker has descended to us, though if any weight be allowed to popular names, it is either the tall Cypress, or, the *Arbor vite*. We have still, however, some powerful agents against the invisible world not acknowledged in the Pharmacopœias: thus, that rather insignificant plant, the common *Vervain*, so honored in the ceremonies of the Roman augurs and heralds, still maintains its reputation in Ireland, where it is called *Luibh na gras*, or Herb of Grace, but is not endowed with any peculiar virtue unless pulled with this incantation:

"Vervain! thou growest upon holy ground:
In Mount Calvary thou wert found:
Thou curest all sores and all diseases,
And in the name of the holy Jesus,
I pull you out of the ground."

The same people hold the Elder tree accursed, as being that on which Judas hung himself; and the Highlanders are of opinion, that the tremulous motion of the Aspen leaves arises from the tree having furnished the wood for the cross, which has the merit of being a poetical explication of the phenomenon. The *SEMPERVIVUM tectorum*, or *Houseleek*, is another venerated plant in Ireland, chiefly perhaps from the prevalence of the zodiacal number 12, in its calyx, corolla, stamens, and carpels: and perhaps also from the anthers producing seed instead of pollen: any prodigy of reproduction being sure to entail a religious respect in most nations. The Mountain Ash perhaps owes its fame as a preservative against witchcraft and sorcery, to the circumstance of its being one of our first trees to come into leaf and

flower, and therefore a favorite of the sun, the grand enemy of all the powers of darkness: while the moon, on the contrary, was the Lady Patroness of all necromancers and witches. It would appear to be still a disputed point what tree afforded the "indestructible Cedar-wood" of the Greeks. The Library of Entertaining Knowledge describes it as being "so bitter, that no insect will touch it, and it seems to be proof against Time himself. We are told, that the timber in the temple of Apollo at Utica, was found undecayed after the lapse of two thousand years, and that a beam in the oratory of Diana at Saguntum in Spain, was fetched from Zante two centuries before the Trojan war." Some refer it to the beautiful, hard, deep brown timber of *CALLITRIS quadrivalvis* (or *THUJA articulata*) the *Sandarach* tree, said by Royle to be the *Koos* of the Arabs, and to produce the resin called *Sundroos* or *Sandarach*, from which pounce is made. It is a native of Barbary, especially the Province Rif or Errif, and all the higher Sierras or Mountain Chains; "the wood is fragrant, very finely grained, and extremely durable, as is shewn in the roof of the Cathedral of Cordova, built in the ninth century, which is of the wood of this tree." The genus *CALLITRIS* has about 20 species in New Holland: they resemble the *CASUARINA* in habit. Lindley (Introduction to the Natural System) says, "I have seen a plank two feet wide of the tree that produces *Sandarach*, and which is called the *Arar* tree in Barbary; hence it is, probably, the *THUJA* (*articulata*), for the Juniper never reaches these dimensions. The wood of the *Sandarach* tree is considered by the Turks indestructible, and they use it for the ceilings and floors of their mosques." The common Juniper may never attain these dimensions, but the *JUNIPERUS excelsa* of Kunawur greatly exceeds them. I have seen a tree at Soongnum, which Captain Hay tells me is 20 feet in circumference, and about 100 feet high. Golius gives *Arar* as the Arabic for the Juniper, and *Sindroos* for its resin; and *Sundrut* as the name of a tree from which bows and arrows are made; but I cannot find, that he mentions the *Koos* of Dr. Royle. The Penny Cyclopædia gives *L'Ariz* as the Berber name of the *THUJA articulata*, of which the timber is known in commerce by the name *Alerce*, which is nothing more than the Arabic *Al-araz*. "The Cedar," or any other coniferous tree, the word *araz* seeming as indefinite in Arabia as *Deodara* is in India. The Editor considers *L'Ariz* as the origin of our *Larix*, in preference to the Celtic *lar*, fat, or the Welch *llar*, wide spreading, which, heretofore, were given as its derivation. Loudon gives "*Alerce*" as the Spanish for Larch. Mr. Lambert refers the Cedar of the Greeks to *CUPRESSUS horizontalis*, the spreading variety of *C. Sempervirens*, Sprengel, to *JUNIPERUS Oxycedrus*, a native of Spain. Homer in the Odyssey, distinguishes between *Cedar* and *Thuja* or *Thuias*; but mentions both as being aromatic. (Odys. V. 59. 60.) Theophrastus describes the *Thuja* as growing in Cyrenaica, and as resembling the Cypress.

It is probable that the seeds of the *CALLITRIS quadrivalvis*, *Arar* or *Sandarach* tree, might be obtained at Gibraltar by some of our outward-bound Overland Travellers; and by visitors to New Holland might be imported to the Himalaya those of several highly useful and ornamental trees, now frequently seen in conservatories, or the open air, in England; such as *ARAUCARIA excelsa*, the *Norfolk Island Pine*, a superb tree, of which some specimens measured by Governor King, were 220 feet high and 11 in diameter; *A. Cunninghamii*, the *Moreton Bay Pine*; and *A. Brasiliana*, which grows 100 feet high, and has also edible fruit. The *DUMETRA* (or *AGATHIS*) *Australis*, the *Kaurie* or *Cowrie* tree of New

Zealand, grows 200 feet high, and produces a light compact wood, free from knots, and a greenish transparent resin making excellent varnish* and the *DACRYDIUM taxifolium*. The *Kakaterro* tree of the same Island is not less lofty, and affords spruce. Nothing can be more elegant than the *DACRYDIUM cupressinum*, 20 feet high, with graceful, pensive branches, also from New Zealand, or more curious than the species of *PRINOCALADUS*, *Fern-leaved Pines*, from Van Diemen's Land; the seeds of *SALISBURIA diantifolia*, (the *Ginkgo* of Japan, and the *Quachow* of China) and *PODOCARPUS nervifolia* are large and edible: the *Ginkgo* grows well, but does not perfect its fruit in England; the *PODOCARPUS macrophylla*, with lanceolate leaves, the *Goonsi* of Nepal affords an article of food; "the peduncle of the fruit, but not the fruit itself, is edible." It is also found at Penang, Singapore, and in Japan, as is *P. latifolia*, on the mountains of Silhet, where it is called *Soplong*. All these would, probably, succeed either at Simla or Subathoo, where Botanic gardens are now in contemplation, in which I hope the *Sweet Chestnut* may also have a trial; it is mentioned as occurring in China.

Sec. 2. *Cupressinæ*.

1. *CUPRESSUS*. In this genus, the leaves are mere scales, closely imbricated, or tiled over each other, generally in four rows; and the Strobili, or cones, are more or less round, composed of 8 or 10 corky or woody, peltate scales; dry, when ripe, with a projecting point or boss in the centre. The male and female flowers are on the same tree; in the former, the four 1-celled anthers are inserted on the lower sides of the scales.

The Genera *THUJA*, *CALLITRIS* and *TAXODIUM*, are very similar, and differ, chiefly in the number of scales to the cone, and of seeds to the scale. The cone of *THUJA* (the *Arbor vitæ* of English gardens) has six scales, with 2 seeds to each, placed at the base, and with only two cotyledons: the male catkins conical, with the pollen in four cases attached to the inside near its base. *CALLITRIS* has solitary cones, with four scales, only two of which are fertile; the male catkin a cone, with the scales in four rows, each with 3 or 4 anthers at the base. *TAXODIUM* has the male catkins in clusters; the pollen in 5 cells: the cone has only two to each scale, each with five cotyledons or seed leaves.

All the Genera exude resin, but differ from the *Abietinæ* in not affording turpentine.

1. *CUPRESSUS t. rupestris*; the *twisted Cypress*, called *Deodar* by the mountaineers in all the districts around Simla, but in their own vernacular tongue *Gulla*, *Gullain*, and *Kullian*; probably, the *Sooryi* or *Soor-eye* of Kumaon and Gurhwal; and some Chumba Shepherds called it *Neur* and *Lewr*: but this is more correctly the *red Cedar* wood, *JUNIPERUS excelsa*. The *Cypress* is abundant in Koolloo; in Bhujee (in the valleys about Shallees) about Kothaee; on the lower declivities of Muhasoo; and there are whole forests about Nynsee Tal, and on the Gagur mountain in Kumaon: Dr. Griffith mentions the "weeping *Cypress*" as being very ornamental about castles and temples, from 2000 to 7000 feet above the sea, in Bootan; but this may be a different tree, the *CUPRESSUS* (or *THUJA Pendula*, or *Pensilis* of China and Tartary, which the Chinese plant by groves.

* The "white dammer" of Amboyna is, I believe, produced there by *AGATHIS lorenzifolia*, the "DAMMER Pine" of the Eastern Islands, which has elliptical, lanceolate leaves, much broader than any of the European Pines. *Indian Dammer* is the resin of the *Baul*.

Elphinstone informs us, that the straight Cypress grows a hundred feet high in the gardens of Kohaut and Peshawar, and that "Cedars and a sort of gigantic Cypress are also among the natives of the mountains" of Afghanistan. Probably, the *Cupressus torulosa* does not extend so far; Dr. Falconer did not find it in Kasmir; and in Moorcroft's Travels, we only read of its occurrence, once in Mundee (a fine wood, 2 miles long, with trees 80 feet high, between Gamha and Rowara,) and again (Travels I. 211) at Labrung or Darcha, about 11,000 feet above the sea, the frontier village of Lahoul in Koolloo and the Ladakh country. "Some of my people had begun to strip them of their dry branches for fuel, when one of the conductors of our caravan came to me in great agitation, and implored me to command them to desist; the trees he said were sacred to the deities of the elements, who would be sure to revenge any injury done to them by visiting the neighbourhood with heavy and untimely snow." These were most likely Junipers.

The *Cupressus torulosa* does not grow spontaneously at Simla, but a group of about a dozen trees may be seen to the right hand on the Fagoo road, 2 or 3 miles from the bazaar. The natural site of the tree appears to be limited to elevations from 4000 to 7000 or 8000 feet above the sea line, but Royle (page 40) says it is found in Kumaon above the limit of the forest, and I have also been told by another Botanist of great reputation, that it abounds near Gungautree, Kedarnath, &c. Subsequent information leads me to believe, that this is a mistake, and that the tree found at these great heights is *JUNIPERUS excelsa*; the Cypress preferring the lower and warmer hills, so that it will, probably, be tender in England. The natives, certainly, confound both under the name *Newar* or *Lewar*; and the name "Shoor" used in Kunawur for the Juniper, appears to be the same as the *Sooreye* of Kumaon. Royle says, that the *JUNIPERUS excelsa* "in its foliage resembles *Cupressus torulosa*, specimens of which, indeed, are mixed with those of *J. excelsa* in the East India Herbarium." "Wherefore by their fruits ye shall know them;" and the mistakes above noticed must be attributed to a neglect of this infallible rule.

The *Himalayan Cypress* grows to a great size; trees from 10 to 15 feet or more, in circumference, are common, and one at Urcho, in the Kothee state, a few coss north of Simla, is described to me as being 6 or 7 feet in diameter. The bark is of a reddish brown, peels off in numerous long strips, and frequently appears twisted, which I suppose is the origin of the specific name. The tree has an erect, free habit of growth, and might easily be mistaken, at a short distance, for a pine; when young, the branches decline pretty much as in the *Norway Spruce*. "Pilgrim" describes the limestone (?) Mountains of Nynee Tal as being covered from about the upper limit of *Pinus longifolia*, 4,500 feet to upwards of 6,200, with "Clumps of most stately Cypress trees; the height of many of them must be at least 150 feet, and all as straight as an arrow. The branches and foliage droop slightly towards the ground, and are so arranged as to make the tree appear a perfect cone. One of a small size which had fallen down, I found to measure 102 feet." The foliage is green, with a tinge of yellow, and the spray, or small branches come off the boughs laterally on each side; they are considerably subdivided and covered closely by the numerous oval-pointed, scale-like leaves, arranged in four rows, resembling so many green cords. The fruit is round, of somewhat oblong, about $\frac{1}{2}$ of an inch long, and is produced in great abun-

dance in dense clusters. Each cone consists generally of ten scales, peltate (*i. e.* like a shield with its handle) convex, with from 4 to 6 facets, rising into a kind of boss in the centre; stiff, and woody when ripe. The seed is ripe about Simla in November, and is small and nearly flat, of a bright brown, with a short wing round its border. There are 6 or 7 seeds to each scale, which have only 2 cotyledons. The timber is white, with a tint of red and yellow, and is exceedingly fragrant, the odour somewhat like that of aniseed. The natives burn it as dhoop, or incense, in their temples, a practice which explains the name *Thuja*, from *thus* fragrance, or *thuio*, to sacrifice: and it answers the double purpose of pleasing the gods, and scaring away the demons, for these, like the common plague, cannot resist the process of fumigation. The Hebrew term *copher*, denoting both the *Cypress tree* and expiation, may be traced to the same source. The timber of our *Cypress* appears to me too soft to be of much use in architecture; but Mr. Barron says it is "considered by the natives of the hills to be quite as valuable as the Deodar, (*i. e.* the Cedar) which in England, even, is fast superseding every other kind of Pine fir. It appears, on the best native authority, to last in buildings for centuries," ("Pilgrim") and again, "The *Cypress* wood has been found most valuable for the roofing of buildings, and every other purpose" at Nynsee Tal. Such ought to be the case from the quality of the other species: and a few years will suffice to prove, whether it deserves the commendation of the natives.

The name *Cupressus* is derived by some from the Island of Cyprus: but as this appears to have been known to the Hebrews in very early times as Kittî, the Citium of the Greeks and Phœnician Coins, it is much more probable that the converse is true, and that the island was named from the tree, as Brasil from the dyewood so called (probably *Bukum* or *Sapan* wood), being plentiful there. This will account for the entry of Brasil wood as an import in the records of Pisa, prior to the discovery of America, a fact which Dr. Wiseman, President of the English Catholic College of Rome, notices in his Lectures as most mysterious and inexplicable. Had he been an Irish Catholic, Dr. Wiseman would, perhaps, have found this matter less mysterious: *Brasil* being a sort of Aerial Paradise of the Celts, of the same nature as the Arabian Gardens of Irem, the Grecian Hesperides, and many more; and though it has, I believe, been invisible since Father Matthew's ascendancy, it is celebrated in Milesian Romance, and enters into the name of places and persons to this day, as Clanbrassil. This Elysium was commonly seen amidst the glowing clouds of the setting sun, and hence, no doubt, a red wood took its designation of "*Brasil*," of which Dr. Johnson observes, "Huet shews it had been known by that name many years before the discovery of that country." If we believe Ovid, the *Cypress* is no other than the "tall and slender" youth *Cyparissus*, metamorphosed into this tree by Apollo for killing one of his deer; an offence, for which, in modern times, men are only transported; but the etymologists, who, as Cowper says, often hunt a word into Noah's ark, have, in the present instance, done so literally, for they affirm the identity of *Cupressus* with *Gopher*, of which the Ark was constructed, referring this last to *Cupressus Sempervirens* common in all the South of Europe and the Levant, where it grows as high as 50 feet, with timber uncommonly fragrant, hard, close grained, and durable. The doors of Saint Peter's at Rome were put up of this wood in the time of Constantine, and were found perfectly sound after a lapse of 1,100 years, when Pope

Eugenius IV. replated them by *brass ones*; (Professor Martyn.) It is this tree which we see in the Taj Gardens, and known in India by its Arabic names, *Suroo* and *Surus*; *Suroo Suhee* being the straight, and *Suroo-axad* the spreading, Cypress. I have read in Arrian, I think, of Alexander (to the best of my recollection,) building a fleet of boats on the Euphrates from the Cypress trees, which abounded on its banks, which are generally fixed as the scene of the Ark-building also; some suppose the *Thuja Articulata* afforded the materials; but that tree seems confined to Morocco and Barbary: whatever it were, the specification of the wood used, sufficiently attests the estimation in which it was held, whenever the account was composed, for durability and power to resist the effects of damp—*Gopher* occurs in the other place; Frey defines it to be a resinous tree, and Gopherith is Sulphur; it is probably identical with *Copher*, which twice occurs in the Canticles, and is rendered Camphire, perhaps from the analogy of the Arabic, *Kafoor*; but in the Margin by Cypress, which is the more probable, as the Camphor tree is there unknown, and the similarity of sound is so great. The root is *Cophara*, he covered, atoned, &c., alluding to the use of Cypress wood in buildings, and perhaps in sacrifices. Pliny gives it a high character, "Cupressus cariem et vetustatem non sentet . . . adversus cariem tineasque firmissima." The word Cypress found in Isaiah only, in our version, is in the original *Thirza* which the Greek, and almost all other translations, render the *Ilex*.

The Cypress has many historical associations; Virgil alludes (A. En. II. 75) to the veneration with which it was regarded, "Juxtaque antiqua Cupressus Religione patrum multis servata per annos." According to Royle it is called in the East, *Shujrut ulhueyut*, or the *Tree of Life*, "and its berries, as its leaves, thought to be a cure for every disease;" and Dr. O'Shaughnessy tells us, that "the Oriental Physicians used to send their patients labouring under lung diseases to breathe the air of Candia, where the Cypress was abundant, in the persuasion that the emanations were particularly wholesome." General Tapp assures me, that the *Thuja orientalis* grows wild in Bundelkund, where it is known as "the Tree of Life." It is somewhat curious, that both this and the Cypress are, in Eastern Gardens, generally found "in the midst of the garden" like their original. The Cypress, however, is in the West, connected with death and witchcraft more than with life; "The ancient Romans, on the death of any high-born individual, were wont to place a branch of Cypress before the door of the house where the corpse lay previous to interment; boughs were also strewn on the bier, and borne by the mourners to the grave." The custom of planting the tree in burial grounds, still universally observed by the Turks, &c., seems very ancient; its evergreen foliage, long life, durable wood, and aspiring form, pointed it out as the emblem of immortality; and the Yew seems to have taken its place in Northern Europe.

The great tenacity of life possessed by the *Aloe*, and its name *Sibz* or *Moorubbur* (Patience), is perhaps the cause why it is found planted by all the graves at Alexandria; adumbrating the patience with which those reating beneath wait for the resurrection. Mrs. Hey of Leeds, however, in "The spirit of the Woods," mentions a less devout reason for the funeral use of the Cypress. "It is said, that the ancients chose this tree when they celebrated their funeral obsequies, from a notion that if once cut down, it never sprang again," and it is doubtless in this sense the French plant is in *Pere la'Chaise*. Horace makes the

Sorceress Canidia use it in her diablerie, as Shakespeare's witches do "Slips of Yew,"

"Jubet sepulchris caprificos erutas,
Jubet cupressus funebres."

And he almost carries the tree into the next world :—

"Linguenda tellus, et domus, et placens
Uxor : neque harum, quas collis, arborum,
Te, præter invias cupressos,
Ulla brevem dominum sequetur,"

which his commentator explains :—"Funebres Arbores, Ideoque *Funestas* appellat, Horatius; Proserpine Ditiqne Sacra, ex Servio, Festo, Plinio, Hic, lib. 16. cap. 33. ita scriptum reliquit, "natu morosa, fructu supervacua, baccia torva, folio amara, odore violenta ac ne umbra quidem gratiosa."

Byron gives this "stoic of the woods" a more amiable character :

"Dark tree ! still sad when other's grief is fled,
The only constant mourner o'er the dead."

The Italians introduce it largely into their somewhat formal Terrace Gardens; and it is also a favorite in Greece. The Athenians deposited their heroes, and the Egyptians their sacred cats and crocodiles in cases of Cypress wood, which is so bitter that no insect will touch it. "For building there is no timber superior to the Cypress, which lasts almost as long as stone itself."

The Cedar of Goa is the *Cupressus Lusitanica*, *glauca*, and *pendula*, of different botanists; it may be seen in gardens at Bombay, with a free, drooping growth, long, light grey, bi-forked branches, and singularly glaucous leaves. It is still uncertain whether Goa or Cintra be its native spot: or whether both had it from China.

Cupressus thuyoides (the *Thuja spherioidea* of Sprengel) or white Cedar, grows 70 or 80 feet high in the swamps of Virginia, &c. The wood is lighter than that of the *red Cedar* (Juniper), and less durable. The wood of *Thuja occidentalis* is also called white Cedar; it grows in the swamps of the United States and Canada, to 25 (some say 50) feet high, with very light and soft grained, but highly durable timber. *Thuja orientalis* occurs of a prodigious height in the valley of Yang-chow-foo in China.

The *Taxodium Distichum*, *Deciduous or Bald Cypress* (the *Cupressus disticha* of Linnæus: the *Schubertia disticha* of Mirbel,) is pretty common in England, and is a favorite from its extremely elegant foliage and tint: unlike the Cypress and *Thuja*, its leaves are linear, flat, disposed in two ranks like those of the Yew (*Taxus*), and deciduous in winter. The timber is much used in building, being highly valued for its durability. It flourishes in the low lands and swamps of Virginia and Louisiana and Florida; also in Mexico, rising 120 feet in height, and from 25 to 40 in circumference. It is this tree which gives name to the "Cypress swamps." It has the curious habit of throwing up from the roots the hollow knobs called "Cypress Knees," as high as two feet, and four or five across at the base.

At Chapultepec in Mexico, there is said to exist a specimen of the deciduous Cypress no less than 117 feet 10 inches in circumference, believed by De Candolle to be above 5000 years old. When the Canon Recupero was engaged in some researches on Etna, his ecclesiastical masters recommended him not to make his mountain older than Moses

had done; and M. De Candolle has been reprehended for making his trees older than the Deluge; his opponents overlooking the fact, that if an Olive tree survived that catastrophe, so might a Cypress or a Baobab. The Deciduous Cypress might flourish in the Delta of the Ganges as it does in that of the Mississippi.

The *Thuja dolabrata* is described by Kœmpfer and Thunberg, who met it in Japan and China, as the most beautiful of all the Cupressines, "a lofty, vast, and beautiful tree, of all evergreens the fairest." It had not been introduced into Europe twelve years ago.

What Mr. Traill's "*Parpinja*," or *Creeping Cypress* of upper Kumaon may be, I know not (*As. Res.* xvii. 10.): if it be the creeping Juniper, the mistake will render it likely that his "*Soorgis*," or *Arbor vitæ* of the same tract, is also a Juniper.

II.—*JUNIPERUS*. In this genus, as in *Cedrus*, the tree is sometimes monœcious, but generally dicecious. The leaves are short, sharp-pointed, usually in whorls of three: but sometimes, they are mere scales, as in the Cypress: and occasionally, both kinds occur on the same tree at different stages of its growth. The male Strobili are small and ovate, at the end of the branch, or at the axil of the leaves, with from 4 to 8 one-celled anthers at the back of each scale. The fertile Catkins consist of three fleshy scales, at first nearly concealed by imbricated bracts, from which they gradually rise, grow more succulent, and finally become consolidated into a small, round, spongy berry, enclosing 2 or generally 3 bony seeds, convex on one side, angular on the other. The berries are, for the most part, deep purple, black, or blue.

As to the etymology of the word, Lindley states (after Royle, he says) that the Juniper is called the Tree of Life in the East; which would point to the Sanscrit Jiv or Jeeo, Life, as one of its elements: Dr. O'Shaughnessy, however, (in the Bengal Dispensatory) mentions the well-known property of the *Savin* or *JUNIPERUS Sabina*, of the South of Europe, which causes it to be "often used for the purpose of procuring abortion:" and hence the obvious derivation from *Juvenis* and *Pario*.

1.—*JUNIPERUS excelsa*. The *Shoor*, *Shoorpa*, *Shookpa* and *Shooko* of Kunawur, in the Thibetan dialect; but *Newur* and *Newor* or *Lewor* lower down; it is the *Dhoopree Chundun* of the Ghoorkhalies; and, perhaps, the *Soorgi* of Kumaon. The name *Thiloo* or *Theloo* is always used, I think, for one of the small species. This tree is found in many parts of Kunawur; as Leepee, Songnum, the Roonung, Hungrung, and Binung Passes; between Nisung and Mooring; on Gosainthan in Nepal: in Kumaon near Neetee; on the Janghee ghat, to the Southward of Rol, near the Shatool Pass; and probably at Gungautree, &c. Dr. Royle says his collectors found it between Simla and Fagoo; but I have never been able to procure any thing but the Cypress from thence. The Juniper appears to flourish at elevations of from 9000 to 13,000 feet above the sea, and this species is said to extend to Siberia. Dr. Griffith found it in Bootan about temples and in woods, with birch from 9000 up to 11,500 feet; and Major Wilcox mentions it, or some similar species at 12,494 feet, on a mountain dividing the valley of the Burrumpootur from that of the Irrawady. Captain Graham includes *JUNIPERUS excelsa*, under the name *Tete*, as a timber tree of Shoa (Abyssinia.) Major Harris calls it *Det*, and says that it grows 160 feet high, and 4 to 5 in diameter at the base. The form is that of the Cypress, the timber very inferior, though much used for huts and churches, by which latter

the tree is often planted, and twigs are often strewn upon corpses before the grave is filled up. Roxburgh notices *JUNIPERUS elata* as a large timber tree of Pulo Penang. Mr. Batten mentions, that in upper Kumaon, above the oaks and elms, towards the Jwahir Pass, whole forests of Cypress, some 27 feet in girth, which I take to be Juniper, and the same as Mr. Traill describes under the name *Sooryi* or *Arbor vita*, with trunks from 20 to 25 feet in circumference: (J. A. S. Oct. 1833, and As. Res. xvii. 9.) In the former work, No. 133 of 1843, there is an account of a forest of Juniper trees, from 18 to 30 feet high, on a table-land 8 miles from Quetta in the province of Shawl, "affording an inexhaustible source of fire-wood, and also rafters for buildings. The wood of this tree is exactly similar to that used in Cedar pencils, and the scent equally aromatic." My experience rather inclines me to prefer Mr. Aiken's estimate. "The Cedar of Himalaya, harder and less odorous than the West Indian Cedar: an excellent light wood." It is red, close-grained, fragrant, and on account of its exemption from the ravages of insects, is in much request at Simla for making boxes, and among the natives for incense, under the name of *Deodar*. Some of the Temples in Kunawur are built of it. I have not seen this tree for above 14 years, and can only recollect that it has a spreading form, and that the trunk often branches from near the ground. Captain Hutton says: "it sometimes attains a goodly size; though generally it is dwarfish, and crooked in the extreme." Loudon describes the Siberian tree as having "leaves opposite; bluntish, glandular in the middle, and imbricated in four ways" or rows.

From the confusion among Europeans and Natives, the leaves of the Himalayan tree must resemble those of the Cypress, as do those of *JUNIPERUS Virginiana* (the *American Red Cedar*) while young: but when old, they become more loose and feathery, in whorls of threes. In *JUNIPERUS Bermudiana* the tree, while young, has long, narrow, spreading leaves, in whorls of three: but when old, they are shorter, and more scale-like, and in whorls of four, like those of our Cypress. Captain A. Gerard says, that the fruit of all the *Himalayan Junipers*, except the *creeping species*, is very bitter; which coincides with Dr. Gerard's account of the berries of *J. excelsa*, which he says are like those of the *bushy species*, "but strongly impregnated with turpentine, and very unpalatable." He also mentions small cones as being thinly studded amongst the berries, which were, either the male cones, if the tree be monœcious, or the young berries; those of the Juniper sometimes requiring two years to repair; most of the Junipers are diœcious.

2.—*JUNIPERUS squamosa*. The *creeping Juniper*, called *Pama*, *Thiloo*, *P'huloo*: and in Kumaon, *Bindhara*; very abundant on Choor, Changsheel, and Kudarkanta, as well as on the Snowy range from Nepal up to Kashmeer; covering large tracts with its low creeping branches, some of which are as thick as a man's thigh, and are furnished with many short, erect branches, very troublesome to a pedestrian. It occurs from about 11,000 to 14,000 feet above the sea-level, in the Himalaya: but Vigne found it in Kashmeer, as low as 6000 or 7000 feet. In Norway, it reaches the Arctic Circle. The leaves are said to be in whorl of three, sharp, narrow, and of a light bluish green: if flowers in June and July, and the berries are ripe in October and November, (probably those of the previous year;) they are of a very dark purple, almost black, and have the same sweet taste and aromatic flavour as those of the European *JUNIPERUS communis*; a handsome erect shrub, 6

to 15 feet high, very common in poor dry soils in the North of Scotland ; and of which there is an arboresecent variety in Sweden.

2. A variety of the common Juniper, called *Bilhara*, *Pudma*, and *Pamaroo*, grows in Kunawur, and near the Neetee Pass, from 3 to 6 feet high, forming a dense, diffuse, irregular bush, with acute, stiff, linear leaves, fragrant, of a pale green, and in sets of three. Berry solitary, size and shape of a small pea : sweet, aromatic, and three seeded : probably the same as those sold in the Indian Bazars under the names *Ubhal* and *Hoobair* ; it is reported to grow at higher elevations than the creeping species near Leepce and Kanum, where it is called *Thiloo*. Mr. Loudon states, that the common European Juniper "on the sides of hills has a long (procumbent) trunk ; but on the tops of rocky mountains and on bogs, grows to be a tufted shrub." Such a difference of habit may induce doubts whether our Himalayan species have not been needlessly multiplied.

3. *JUNIPERUS religiosa* ? This is said by Royle to be called *Googul*, and to be used as incense, which agrees with what some Soongnum men told me of a shrub a foot or two high, very fragrant, and of which they present sprigs to the Deotas. They called it *Phuloo*, and mentioned another sort.

4. *JUNIPERUS recurva* ? called *Aroo* and *Ugwroo*,* growing 3 or 4 feet high, also esteemed as Dhoop ; but this is, perhaps, the variety of *J. communis* ; No. 2 and No. 4 may be the "*Bettir*, another sort of Juniper," mentioned by Captain A. Gerard, as reaching to 13,000 feet. The wood seems synonymous with his "*Bidel-gung*," but the people of Chumba, Koolloo, &c., whom I asked here, all applied the word "*Betr*, *Bestur*, or *Bytr*," to *J. squamosa*, of which alone I had a specimen to show them.

The whole subject remains involved in much obscurity. Mr. Traill states, that in Upper Kumaon, the sprigs of the *Bindhra Juniper*, and of the *Sooryee*, *Arbor vite*, are used in the preparation of Yeast (Balma :) as the aromatic crushed berries of the common Juniper are in Europe to flavour *Gin*, which plebeian word is an abbreviation of the French and Dutch, *Genievre* and *Gennever*, for the Juniper : but so high is the duty on this fruit in England, that our distillers often, fraudulently, substitute Oil of Turpentine. Mr. Vigne tells us, that in Ludakh, small branches of the *dwarf Juniper*, fried in goat's grease, are used for incense in the temples, as well as in magical incantations : probably No. 3.

The red Cedar of America, *JUNIPERUS Virginiana*, grows in deep sandy loam in Virginia and Carolina (and I believe in Jamaica,) and as far North as 44 or 45° ; it flourishes most by the sea, where it grows 40 or 45 feet high, and 12 or 14 inches in diameter. The berries are deep blue, and have only two seeds in each. The Sapwood is white, but the heart wood is red and fragrant ; strong, close-grained and durable ; it is used for pencils ; but for this purpose, as well as cabinet work, that of *JUNIPERUS Bermudiana*, being soft and extremely fragrant, is preferred. It grows to be a large tree in the Bermuda Islands, and its berries are of a dark red.

The word Juniper occurs three times in our version of the Old Testament, but the original word "*rothem*" has no reference to this

* *Ugwroo* is properly the Eagle-wood of Ava and Siam, *Aquilaria agalocha*.

plant, and denotes, no doubt, the *SPARTIUM monosperma*, a species of broom, which is still known to the Arabs by the same name, *Rutum*, defined by Golius, '*Genista frutes*.' Any of the camel drivers, between Cairo and Suez, will point it out under this name to the traveller, who may see it of a much larger size among the gullies in the volcanic rocks above Back Bay at Aden: one cannot contemplate its thin, drooping, glaucous, and almost leafless branches, without feeling, that their scanty shade was ill adapted to diminish the indignation, or assuage the grief, of the prophet. It compensates the florist, indeed, by a profusion of white blossoms in the spring, and is abundant by the sea shore about Gibraltar. Our translators had, probably, the "*Juniperus gravis umbra*" in their minds: and when they make the Psalmist denounce "coals of Juniper" on the head of the wicked, they may have thought it a poetical justice that those who have so often abused the fruit should smart by the stem. The truth of the allusion is, however, wholly lost: for to this day the *Rutum* is extensively converted into charcoal. Job speaks of the poorest as using its roots for food, or perhaps as a means of getting it. Juniper charcoal is said to retain its heat for a very long period, even 12 months have been mentioned; and the "heavy shade" perhaps refers to the circumstance that grass will not grow under the tree.

Sec. 3. *Taxinæ*. The Yew Tribes.

I. *TAXUS*: the Yew Tree. This genus, as well as *DACRYDIUM*, *PODOCARPUS*, *PHYLLOCLADUS*, and *SALISBURIA*, above mentioned, have been separated by Lindley from the *Coniferae*, and formed into a distinct order, *Taxaceæ*: for though the Genus Yew has leaves like the Silver fir, those of the rest rather resemble the leaves of the Ferns: and in none can the fruit be properly called a cone, being a solitary hard seed, either, "altogether naked," as Lindley says, or, as in the Yew, surrounded by a succulent, colored, cup-shaped pericarp; nor does the tree afford, I believe, either resin or turpentine.

The word *Taxus* is probably like the Greek *taxon*, a bow, from *Taxo*, to pull, to draw: man having learned the arts of war and hunting before his language was perfected. The Italian is still *Taxo*: our "yew" and the French "if" are said to come from the Celtic "iw" "green."

1. *TAXUS baccata*. *Thoon*, *Birmee*, and in the Chumba and Kooloo mountains, *Riker*, the *Postil* of Kashmeer. Moorcroft gives "*Tooner*" as the name of the *Toogasee* mountain towards the Neetee Pass: and Traill, "*Thumers*" in Upper Kumaon. According to Royle "*Tooners*" marks the *TAXUS nucifera*, which is a species that I am unacquainted with: *Thoonera* is the *Picea Pindrow* at Fagoo and Bhujee. The *TAXUS baccata* is common to Europe and the Himalaya; it does not grow at Simla, but is found in abundance and of vast dimensions on Kumuloree, Choor, Huttoo, Kedarkanta, and all over the main range and its spurs, from 8000 to 11,000 or 12,000 feet above the sea. It flowers in May and June, and the fruit is ripe from November to January. The male and female flowers are generally on separate trees; the former consisting of a number of scales, out of which the 8 or 10 connected anthers grow like a minute cluster of primroses; the fertile

flowers, like those of the Juniper, are enveloped in scales, from which they gradually emerge, and when ripe, open at the top, displaying the ripe nut, a bony seed, seated in a red juicy cup. The ancient naturalists held the fruit to be poisonous: and, even the shade of the tree to be noxious; but this last accusation is groundless, and many are now of opinion, that the fruit also is harmless; and I have been informed, that the hill men eat it with impunity, probably in small quantities. Major Harris says of the *Sigma* or *Taxus elongata* of Shoa, in Abyssinia, "to tarry beneath its shade, or to inhale the smoke of burning yew-wood, is regarded as particularly noxious." The seeds of *Taxus nucifera* are an article of the Chinese dessert. De Candolle holds the succulent cup of the fruit of the common yew to be deleterious, and the leaves are "by common consent, deemed poisonous," and are especially fatal to horses and cows. I believe the berries are offered in incense to the Himalayan-Gods, as Captain P. Gerard tells me is also the wood. Dr. Royle mentions, that the leaves of both species of Himalayan Yew are exported to the plains, being much used in native medicine; and Mr. Vigne (Journ. A. S., September 1837) tells us, that in Kashmeer "slips of Yew bark are used instead of tea, and the decoction is drank as freely. The Booltees of Ludak carry a great deal of Yew from Kashmeer for this purpose." The Kunawurees at Simla tell me of a tree called *Sungdum* or *Sungcha*, which has an aromatic bark, the decoction of which is drank for rheumatism, &c. I was disposed to refer this to the Yew, but it is more likely to be Royle's *TATRANTHERA apetala*, or *CINAMOMUM albiflorum*, generally called *tex-pat*. I think it is Captain Hutton who mentions a kind of green tea produced at Jaghul or Jukhul, between Rampoor and Seran, as well as the bush *Pangcha*, near Leepee in Kunawur, the leaves of which, exposed to the sun for two days, and mixed with the *Changta* or *Jatta*, gum of a tree called *Trin*, found near the same place, are also used as tea. It would be interesting to know, whether the Leepee Shrub be a species of *CAMELIA*, or whether they have the *RHAMNUS theoxans*, from which the poorer classes in China extract a sort of tea.

Dr. Royle mentions, that in Kumaon, Tea is made from the leaves of the shrub *Ostrya Nepalensis*: and this is, probably, the Green Tea of Bisehur, which Moorcroft (Travels, I. 352,) describes as being imported into Ludakh under the name of *Maun* or *Bisehur Tea*; the produce of an evergreen shrub, $4\frac{1}{2}$ feet high, growing on a dry soil in Koolloo and Busehur, on the banks of the Sutlej, and especially about Jhagul, between Rampoor and Seran. The leaves are gathered from July to November, and, after infusion in hot water, are rubbed and dried in the sun. They sell at the rate of three seers per rupee, and are not much in request. The first infusion is reddish, and is reckoned heady: the second, which is used, is yellowish-green. The *Ostrya Nepalensis* grows to be a large shrub, 10 or 12 feet high, in the Kotar Khud, above Subathoo, and between Kussowlee and Kalka, where it is called *Krecoontee*, *Keoontee* and *Kuneentee* and also *Loonkt*. The fruit is known by the name of *Peepia* or *Peepra*, also applied to that of *MURRAYA exotica*. The natives here use the leaves medicinally, but not I believe as Tea. The Black Tea of Busehur, Moorcroft describes as the produce of a deciduous shrub, found near Uarung and Leehhee in Kunawur, of which the leaves are pulled in July and August. The infusion is of a dark red color. Uarung is very elevated, for a species of *Rhubarb* flourishes in the neighbourhood. Major Harris mentions that in Abyssinia, a kind of

Tea, prepared from the dried leaves of the *chaat* or *kat* (*Celastrus edulis*) is in general use.

The wood of the English Yew is red, beautifully veined, and very hard and smooth; it has been famous for bows, since the time of Homer; and is still much valued for floodgates, axle-trees, cogs of mills, pins for pulleys, and various articles of the turner. It seems quite neglected in the Himalaya.

Mr. Aiken reports on the *Taxus virgata*, called *Dheyri* and *Lolsi* in Nepal; "timber strong and good, axis very eccentric, wood softer, of a paler color, and less lustre than English Yew." The timber of the trees on Huttoo is of a most brilliant red. Major Harris tells us, that in Shoa, the timber of *Taxus elongata* is tough, and used for works of art, which are to last some time. It is called "*yellow-wood*" at the Cape of Good Hope.

In the "Spirit of the Woods," Mrs. Hey states that by Statute Law, every Englishman was formerly obliged to possess a bow of Yew, *awburne*, or some other fit wood: and adds, that *awburne* is supposed to be Alder: this is an oversight; it is well known to be the *Laburnum*, which is still called *Awburne Saugh* (or *willow*) in many parts of Scotland, and in Germany '*Bohnenbaum*' or *Bow-tree*. The old French is *L'Aubours*, which, as well as *Awburne*, are probably corruptions of the Latin *Laburnum*.

Many of the Yew Trees of Great Britain are, or were, of enormous dimensions, and quite a patriarchal age. One in the Churchyard of Harlington, near Hounslow, is 58 feet high: and another at Hedsor, in Buckinghamshire, 27 feet in diameter.

Some trees at Fountain Abbey, near Ripon in Yorkshire, were, in the year 1770, more than 1,200 years old, and 1,214 lines in diameter; and one in the Churchyard of Crowhurst in Surrey, said to be alive still, was in 1660, 1,287 lines (or 30 feet) in diameter, and believed by De Candolle to be 1450 years old. At Fortingal, in Perthshire, there was a monstrous Yew, which in 1770 was 2,588 lines (or 56½ feet) in diameter, and calculated to be 2500 or 2600 years old: the Romans had a fortified camp at Fortingal ("The fort of the Strangers,") so that "if the chronicles lie not," as Don Quixote says, this tree must have been about 1000 years old, when these invaders appeared in Scotland; and, perhaps, existed before the Caledonians themselves peopled the country. A Yew in the Churchyard of Braburn, in Kent, was in 1660, 2,886 lines in diameter, which, if it still exists, must be 3000 years old! At Ankerwyke, near Staines, is said to grow the Yew under which Magna Charta was signed.

In addition to his report on the timber of *Taxus virgata*, in Nepal, Mr. Aiken states, probably on the authority of Dr. Wallich, that "the green branches are used to adorn houses during certain festivals." Mr. Loudon informs us (Ency. of Gard.) that the spray of the Yew was substituted for palm leaves by the ancient Christians. It is still so called in Ireland, and used on Palm Sunday; but in England the yellow flowers of the *Black Willow* (*Salix Caprea*) are, I think, called *Palms*. The practice may be a remnant of the Druidical worship, which, with its circles, Cromlechs and Cairns, still reigns, altered merely in name, in many parts of the country. One strange rite, still in vogue at Ardmore, in Waterford, consists in squeezing the body under a great stone lying on the sea shore; or through a narrow crevice between two stones: and thus gaining absolution. This outward and visible sign of the Pa-

lingeneſia of Pythagoras is ſtill in full practice at Pak Patun on the Sutlej, and other holy ſpots in India. (Vide notes to Major Lawrence's "Adventurer in the Punjab.") Moor (Hindoo Pantheon) mentions one in the Deccan, and gives a ludicrous account of a fat Mahratta Chief, who got jammed into a "fix" in executing the myſtic feat. Mrs. Hey enumerates among the living ſuperſtitious of England the "paſſing a ſick child through a young aſh, cleft for the purpoſe:" the aſh yqqd-raſil, according to the Edda, having been the parent of the human race; an origin which is, alſo, recorded by Heſiod, who derives the men of his braſen age from the MELIA or *Aſh-tree*, though his commentators explain this to allude only to their warlike propenſities; the aſh forming the ſhafts of ſpears in times of old. On Innisfallen Iſland, Killarney, there are ſome magnificent Aſhes, and I think it is through a chink in one of them that the viſiter is begged to paſs for good luck. The very beautiful cuſtom, now becoming obſolete, of decorating churches at Chriſtmas with *holly*, *mistletoe*, and other evergreens, is well known to have come down to us from the Pagan Saxons, who were accuſtomed at this ſeaſon to hail the return of the ſun from the Southern Tropic as a new birth: and hence it is, that under his various designations, we always find ſome evergreen, or other, conſecrated to him; the *Ivy* to Bacchus, which not only preſerves its leaves, but bloſſoms and ripens its fruit in winter; the *Bay* to Apollo, not only from its fragrance and being an evergreen, but perhaps becauſe it "poſſeſſes, in a remarkable degree, the power of reſuſcitation; long after it has appeared dead, if left undiſturbed, it will put forth leaves again, and aſſume its priſtine vigor." Thus the Vedas term the *Doob Grass*, a deity, not ſubject to age or death. The *mistletoe* was ſacred to Balder, the Scandinavian Apollo, and was held in much veneration by the Druids, probably becauſe it flouriſhes through the winter, and detached from the earth. It appears, however, that this veneration was only due to the *mistletoe* when found on the Oak, where it ſeldom, if ever occurs: juſt as the Hindoos ſay the man's fortune is made who finds the root of the "etherial creeper" *Akaſh-Bel*. I am ignorant whether any tree be particularly devoted to Krishna, the Indian Apollo, who, with the reſt, is ſo evidently nothing more than the impersonation of the Sun, the Eye and Soul of the univerſe, as he is ſo frequently called by Shakeſpeare and Indian Poets. Should it be thought deſirable to preſerve theſe time-honored cuſtoms at Simla, the materials, *holly*, *ivy* and *mistletoe* are in abundance at hand: the laſt growing on the wild Pear Trees, and called *Bunda*, ſeems identical with the *Viscum album* of Europe.

There is a ſpecies of Yew peculiar to Ireland, which Lindley calls *Taxus ſaſtigiata*; it was firſt found on the hills of Fermanagh, and differs from the common kind in its erect cypreſſe-like growth, and by the leaves, which are very dark, being ſcattered round the ſtems, inſtead of being in two ranks. There is alſo a ſpecies of *Furze* peculiar to the ſame country, which, from its ſtiff, erect habit, is called *Ulex ſtriata*; theſe with the *Arbutus*, the *London Pride*, *Mediterranean Heath*, *Mackay's Heath*, and that of *Saint Dabec* (*Menziſſia Dabecii*) a beautiful plant, comprise all, or nearly all, the flowering plants in which Ireland is richer than England; while there is a heavy per contra account of Engliſh plants unknown in Ireland. Fraſer mentions his delight on recognizing the *Heather* near Gungautree; but the Himalaya poſſeſſes neither heath nor furze; the former being *Cassiope ſaſtigiata*,

nearer to ANDROMEDA than to *Frica*, and so called in Royle's Illustrations; and the furze consists of various species of CARAGANA, GENIST, and ASTRAGALUS.

Dr. Royle gives Japan, Nepal, Kumaon, Choor, and Kedarkanta as the sites of *TAXUS nucifera*, of "Thooner." It has been referred by Bronquiart to the genus SCHUBERTIA or TAXODIUM.

Though attaining such huge dimensions, and of such utility as Timber Trees, the Coniferæ possess an organization inferior to that of other forest trees, the "hard wood" of the Scotch, including two small orders, *Cycadeæ* and *Gnetaceæ*; they are classed by modern botanists by the term '*Gymnospermæ*', because the female-flowers have no pericarpial covering, but consist of naked ovules, to which fertilization is communicated directly from the pollen, without the interposition of a style or stigma, which is analogous to the ova of reptiles in the animal kingdom. The male flowers consist of catkins formed of a number of scales, in the body of which the pollen is contained in two or more cells.

The *Cycadeæ* (CYOAS, ZAMIA, and ENCEPHALARTUS) have cones like the pines and firs, with naked ovules; the imperfect structure, also, of the spiral vessels of their woods, as well as its being marked with circular discs, approximates them to the *Coniferæ*. They have the gyrate or circinate veneration of the Ferns, i. e. they unroll their young leaves like the crook of a shepherd's staff, and Linnæus referred them to this tribe; and Lindley observes "so great is the resemblance between certain LYCORODIUMS or Club Moss (*L. Phlegmaria*,) and certain *Coniferæ* (CUNNINGHAMIA *Sinensis*), that I know of no external character except size by which they can be distinguished;" some of the *Cycadeæ* have the long pinnated leaves and the simple cylindrical stems of the Palms; but there the resemblance ceases; and their true position is next the *Coniferæ*. *CYCAS circinalis* is not uncommon in Indian Gardens, and is said to grow naturally from Tellicherry to the foot of the ghauts; it affords Sago, but the true Sago Palm is *C. Rumphii*. The Genus ZAMIA yields a kind of Arrow root. Both genera are found in a fossil state in England, forming one of the many proofs of the great alteration which has taken place in its climate.

The Genus EPHEDRA comes very near *Coniferæ*; but the male flower has a colored perianth; Royle mentions EPHEDRA *Gerardiana* as occurring in Kuluawur; and the sandy wastes of Shekhawatee and the "Indian Desert" to the Sutlej, are covered with the "*Phok*," another species, which in the hottest season of the year, when everything else is burnt up, covers the country with verdure, and is greedily devoured by camels. This shrub produces abundance of pretty pink flowers in March and April, and the seed is ripe in June: instead of a wing, it is covered with rough, brown fibres like a coarse wig. Elphinstone describes it as "a plant from 4 to 5 feet high, quite green, although it has no leaves. Its branches run into tender twigs, which terminate in bunches of the same material, but still softer and fuller of sap. It bears clusters of flowers, which are eaten by natives, and has its seed in a pod."

In the Journal of the Asiatic Society for 1841, Captain Halsted mentions a large creeper called *Jabroon Nony*, as being common on Chedooobā, and says that it is very useful to the Islanders from its stems, when cut across, yielding abundance of a good palatable water; a piece two feet long, and as thick as a small wrist, affording more than half a

pint of water; it is probably the *GNETUM Scandens* of botanists. *GNETUM* and *EPHEDRA* from the small order *Gnetaceæ* of Lindley.

EQUISETUM or *Horsetail*, of which there is a species common by the streams below Simla, and *CASUARINA*, resemble *Coniferae* in several particulars; and Lindley considers the former as a "degenerate" genus of that tribe. It is remarkable for the quantity of silicx contained in its stems in minute crystals, which are obtained by burning the plant, and are very useful in polishing. *CASUARINA muricata*, "The *Timian Pine*," is a native of Chedooa and many of the Eastern Islands; it is a beautiful tree, and is now thriving in many gardens, avenues, &c. from Calcutta up to Kurnaul; with a general resemblance to the *Thou* or *Furus* (*TAMARIX*) for which it is sometimes mistaken, but which is quite a distinct tree.

NOTES TO THE FOREGOING ARTICLE ON THE CONIFERÆ.

It has been stated in the text, that the *RHODODENDRON Arboreum* cannot, unprotected, support the severity of an English winter; of this fact there is, I believe, no doubt, and yet the result of observation at Simla and Muhasoo during the past winter, inclines me to refer it to mismanagement, arising from inattention to the conditions under which the tree flourishes in its native mountains. Here, though found almost everywhere, it seems to prefer the Northern to any other exposure, and not only to grow more abundantly, but to exhibit a loftier height and a more exuberant bloom than on the other aspects. Owing to our very dry and warm autumn, it commenced to flower in December, and continued with little or no intermission till the middle of the present April, to impart a splendor and gorgeousness to our woods which must be seen to be realized, and which will justify my adding a few words on the probable means by which this scarlet Lady of the Himalaya might be naturalized as a citizen of our green but more sober English Woods. Not to mention several minor falls, and many nights and some days of hard frost, the snow fell on the 10th February to the depth of from 3 to 5 feet at Simla, where patches of it remained till early in April, yet with its roots enveloped by this chilly bed, and the branches exposed to the most boisterous and bitter storms of rain, hail, sleet and snow, the blossoms continued to develope themselves unchecked. We must therefore conclude, that it is more the dampness than the coldness of our English climate and soil which proves so unfriendly to the Tree *Rhododendron*. In Great Britain, the different shrubby species from Pontus and the United States are generally planted in a rich soil and on a level site: in the Himalaya, on the contrary, the *RHODODENDRON Arboreum* affects the steepest declivities, which are, of course, thoroughly drained, and where a poor, cold soil rests on a substratum of rubble, commonly of clay slate, or mica slate, tending still further to keep the site dry. Were these particulars imitated in England, and the young trees merely defended in the manner we find them here, viz. by a screen of *Oak Nurseries*, I am inclined to think, the *Rhododendron* might be thoroughly acclimated.

2. *Pinus excelsa*. This tree is called *Cheeloo* and *Cheela* in Gurhwal and Kumaoon. The Aphides which have been mentioned as covering the branches here last autumn, and secreting a kind of manna from its

sap, have survived the severity of the winter, and continue (April, 1845,) their work in countless multitudes, but the heat of the sun seems to prevent the manna from concreting, as it did towards the conclusion of last season.

Professor Ehrenberg, distinguished for his accurate Microscopic researches into the organisation of the infusory animalcules, &c., explains, from personal observation in 1823, the production of manna near Mount Sinai from the tree which he calls the *TAMARIX Mannifera*, and which resembles closely that known as *Furus* or *Jhow* in N. W. India. "Manna," says he, "continues still to fall in the Peninsula of Mount Sinai, though not from heaven, but from the Tamarisk bush. The thin branches of the Tamarisk are covered with numerous insects which perforate the bark in innumerable places not visible to the naked eye. From these wounds in the tree, there exudes after rain, a clear, slowly-running juice, which the Arabs collect, generally from the ground, less rarely from the tree itself, and eat it with bread, as if it were honey." On the authority of the Professor's Microscope, we may, therefore, perhaps safely conclude by analogy, "that the Manna of *P. excelsa* exudes from the tree directly, and is not a secretion of the insect."

3. *PINUS Gerardiana*. The leaves of this species are only from 3 to 4 inches long, in unsheathed packets of threes. It is a straggling tree, and by what I have heard from more recent travellers, I am inclined to believe, I have overrated its height in comparing it with that of the *Cheer*, *P. longifolia*.

4. *Picea Pindrow*. From my notes, I find that this tree is also known as the *Bola-row*, *Boorhur* and *Boorla*, and Dr. McGregor heard it called *Booldoo* at Nagkunda. I measured one there in 1830, 13 feet round at 6 feet from the ground, and another 17 feet at 3 feet from the ground, but in the *Choor*, &c., they considerably exceed these dimensions. The *Pindrow* seems to be the *Rehee* of Gurhwal, and to the best of my belief, the *Ragha* of Kumaon is *ABIES Smithiana*, though, in my notes, I also find it affixed to *PICEA Webbiana*. Perhaps some gentleman resident in Kumaon would favor Dr. McGregor with a distinct enumeration of the provincial names of the various pines. The word *Koodrow* (the *Khutrow* of Dr. Royle?) implying, I am told, the prickly or thorny pine, is applied between Joonug and Muhassoo, indifferently to *PICEA Pindrow* and *ABIES Smithiana* (*Uslee Row*) the *PINUS Khutrow* of Royle; and if the words be identical, and the etymology be just, the term *Koodrow* more aptly describes the *ABIES Smithiana*. Repeated inquiry, and from independent sources, is absolutely requisite to ensure any certainty in native nomenclature; and the name should always be procured where the subject is abundant and familiar.

5. The snow of the past winter has gone far to disprove the hypothesis alluded to in the text, that nature had provided the cone-bearing trees with acicular leaves in order to obviate its destructive effects in overthrowing or breaking them by its weight; so far as the Cedar is concerned, the provision, if such there be, has proved so completely fruitless that were such heavy falls of snow to occur yearly, the species would be, perhaps, exterminated. Both in Simla and Muhassoo very many fine trees, and a vast number of smaller ones, were thus destroyed; quite as much as the *Ban* and *Mohroo* Oaks with their broad leaves. The larger trees were generally uprooted, while the younger ones were snapped in two, every where blocking up the roads and woods. However, the author of the notion has still the Frenchman's consolation,

"If the facts do not agree with my theory, so much the worse for theirs."

6. While on the subject of the Cedar, I may state that Messrs. Erskine, Cartwright and Dunlop, in 1840, measured one near Chansoo, in the valley of the Baspa, on the Northern face of the Himalaya, which was 36 feet in girth, probably the same which ten years before, the Messrs. Inglis had estimated at 36 feet 8 inches. Two measured in 1830, by Captain Pepper and myself near Taranda, were, respectively, 19 and 21½ feet in circumference; and two others, between Taranda and Nachar, were, one 20 and the other 36½ feet round at 5 or 6 feet from the ground; the last is the tree referred to in the text. At the height of 30 or 40 feet, the trunk divided into eleven stems, each a tree in itself. The Chansoo tree is single. A writer in the *Gleanings in Science* for February 1830, under the initials of J. A. H. (probably Hodgson) says, "I have frequently measured the larger trees, and found them 24 feet in circumference * * * at 6 feet from the ground; but those of about 18 feet in circumference are more common." He says, "you know that the red wood used for black lead pencils is usually called Cedar; it is really a species of Juniper, * * * but the tree which I have in this note denominated Cedar, is the great *Pinus Cedrus*, the Cedar of Lebanon, with the description of which it agrees in every particular; the cones, the leaves, the spreading branches, great size of the tree, the durability yet brittleness of the wood, and its peculiar smell. This noble tree, which towards the Sutlej is called *Cailou* or *Cailang*, but in Gurhwal and the Eastern mountains *Deodar*, flourishes on the N. W., North and N. E. faces of the mountains, and at the elevation of from 6000 to 9000 and 10,000 feet, though occasionally below and above both those limits: its nature seems to suit best with an elevation between them." Hodgson says of the wood, "It is reckoned the most durable of all timber, and most valuable in house-building; but, it is too brittle for ships' masts." It seems, however, flexible enough in the beams of the houses at Simla. Of its inflammability, we have lately had too unquestionable evidence in the accidental destruction by fire of Mr. Charles Gubbins' house on the 1st of April, the spacious roof of which, once ignited, burned with the utmost fury and rapidity, while the "Chooles" or great beams imbedded lengthways in the walls continued to burn for three days till the whole were consumed. Perhaps, however, the Cedar wood is not to bear the whole blame, as near the chimnies, there was a coat of pitch which greatly aggravated the natural combustibility of the timber, and there the fire originated.

The cones of the Himalayan Cedar make but a trifling, if any, increase in size during the winter months; and early in April, when the new leaves, begin to shoot forth are not above an inch long, but are still quite large enough to exhibit the formation of the seeds. From May forward, they rapidly attain their full development, and are ripe in October. The young plants spring up at Simla in the following March, when the narrow green cotyledons or seed leaves, about 1½ inch long, bulging out at the base, but confined above by the integument of the seed with the wing at the top, exhibit a balloon or cage-like appearance.

Of 100 which I examined, one had 8, sixteen had 9, thirty-five had 10, thirty-two had 11, twelve had 12, and four had 13 of these seed-leaves. I have somewhere read that the Cedar of Lebanon requires 27 months to mature its seeds: if this circumstance be true and constant, it would seem to establish the fact of a specific difference between it and the *Kelou*,

which only requires a year. Dr. Royle states that the fungus known in Europe as the Morel, the *Khana Kutchoo* of India, called *Cheecoon* in the Himalaya, is brought for sale to the Hurdwar Fair from Kashmir; it is also produced in abundance about Simla, especially under the young Cedar tree; and is brought to market by the Hill men in March and April, and being savoury in sauces and stews, meets a ready sale. It is the *MORCHELLA esculenta* of Botanists, or a nearly allied species.

7. *CUPRESSUS torulosa*. "The *Loo*" and "*Bool*" appear to be its names in Joobal; and *Lewor* or *Leaur* about Gungautree, &c., but I have already expressed the doubt whether this be not the tree Juniper: *Sooryi* and *Soorae* appear both Gurhwal terms for the Cypress. The last occurs pretty abundantly in the mountains of Jounsar above Mooshk, near Nansoo, on the route from the Choor to Mussooree.

8. *JUNIPERUS excelsa*, also known in Kunawur as the *Shirkoo* or *Shiryoo*. A reference to some notes kept there in 1830, informs me that the specimen at the Soongnum Temple, alluded to in the text, measured in that year thirteen feet in girth at five or six feet from the ground. Either Captain Hay's admeasurement in 1844 was made lower down, or the tree has grown considerably in the interval of fourteen years. There is also a fine specimen of this tree by the Temple at Leespee. At Nungheea, the frontier village next to Shipkee in Thibet, I noticed small altars on the roofs of the houses decorated with sprigs of this tree.

Lieutenant Herbert, when he went up the Jahnavi river (the main source of the Ganges) found the Juniper Cedar in the form "of a small tree." (Gleanings in Science, Feb. 1830.) This work (p. 118) informs us, that neither the Rhododendron, the *Kelou*, nor any of the pines of the N. W. Mountains are to be found at Darjeeling.

9. Mr. Erskine informs me that the wood of the Yew is not unfrequently employed at Simla for the shafts of Jampans, a purpose for which it is well adapted by its toughness and elasticity. On further enquiry, I find that the proper Hill name of the *Ostrya Nepalensis* (used for tea in Kumaoon) is *Karu* or *Kurwa*. The shrub grows plentifully in the warmer parts of Kurol mountain and in the glen of the Asun, thence up to Joonug. As the native names are so uncertain, the shrub will be best identified by its round yellow or orange berry with one seed.

10. With reference to the circumstance of the house-leek being planted on the thatched roofs of houses in Ireland, I find on looking over Ellis' edition of Brand's Popular Antiquities, that the same custom is followed in some parts of England, with a view to preserve them from thunder and lightning. The plant seems there to be called *Syngreen*. This work gives us some curious particulars of the superstitious veneration in which a similar plant, the Orpine, or Midsummer men (*SEDUM telaphium*) is, or was, held in some parts of England, being reported to possess magical powers when planted in houses on the eve of the day of the Summer solstice. Gerard says of it, "This plant is very full of life. The stalks set only in clay continue a long time, and if they be now and then watered, they also grow green." And Spenser sings of "Orpine growing still." It was doubtless the tenacity of life which imparted its sacred character, as to the *Doob* Grass of India and the Aloe in Arabia. Brand also mentions the veneration paid by our ancestors to St. John's Wort (*HYPERICUM perforatum*) gathered and fixed over doors at the Summer solstice (St. John's day) and which had the valuable property of driving away all witches, &c., and its Greek name imports that the ancients decorated the images of their gods with it.

There are several handsome species in these mountains, especially *Hypericum cernuum* called *Kureroo*; but I cannot find that either this or any of our *Sedums* are regarded with any feelings of religious estimation. The Botanical superstitions of India seem to have affected the useful rather than the spiritual, and to have been rather connected with the art of transmuting the metals into gold, than that of persecuting and injuring old women. Mr. Brand also states that the practice of passing sickly children through a cleft ash-tree, in order to effect a cure, is still rife in some parts of England, the tree being carefully bound up again on the completion of the ceremony, as by a kind of vegetable magnetism the life of the patient is supposed thence-forward to depend on that of the tree. The existence of such a superstition illustrates the cosmogony of the Edda and of Hesiod, which derives our race from an Ash-Tree. Brand furnishes the particulars of several other heathenish rites, and also the proper materials for various spells and charms, such as Fern-seed, to enable the bearer to become invisible, which would be a truly dangerous privilege.

In an early portion of this paper, I quoted the second book of Samuel, in evidence that so long ago as the time of David, *fir-wood* was in use in the construction of musical instruments. A reference, however, to the parallel passage, in the first book of Chronicles (xiii. 8) tends to destroy this proof; for there, a very trifling difference of the letters and their allocation, gives quite a different sense to the passage, and excludes all mention of *any* wood; and as the Greek translators have, in both places, followed the latter reading, the other is probably a corruption of the text, which will leave Virgil in full possession of his prophetic honors with respect to the "Cremona."

NOTES TO THE PRECEDING ARTICLE ON THE CEDAR OR DEODAR.

Since the observations in the text were written, a friend has furnished me with Professor H. H. Wilson's definition of the word "Devadaru" in his Sanscrit Dictionary: "A species of Pine (*Pinus Devadaru*;) in Bengal it is usually applied to the *Uvaria longifolia*, and in the Peninsula to another tree (*Erythroxylon Sideroxyloides*.) From *Deva*, a deity, and *daru* timber:" which last is from the root *dri* to tear, split, divide.

Dr. Wilson's explanation of Kedar is "a field, a mountain, a name of Siva, Kedar, part of the Himalaya; a basin for water round a tree, a bed in a garden:" from *ke* the earth or the head, and *dri* to divide; and Kedar, from the same roots, is actually given as "the name of a plant;" as is Kadar, "a white sort of Mimosa" (also in Persian, "the name of a fragrant plant,) from *ka* water, and *dri* to tear or divide. This last signification of *ka* ("water") is evidently that from which Messrs. Traill and Conolly derived their translation of Kedarnath, "Lord of the running or abounding streams," and if it be supposed the Greek word Cedar had a Sanscrit origin, Conolly's second rendering "Lord of the Cedars" is also admissible—"the earth-splitter" being no bad description of the Cedar with its great roots. I have preferred referring the Greek word to an Arabic origin, as the tree only grows where that language, or one of its dialects, was in use; of these, also, the Arabic *Kadar* and the Hebrew *Kidron*, are said to denote

"opaque" "obscure," which might allude to the deep color or shadow of the tree: but if a Greek derivation be insisted on, the only one I am acquainted with is that supplied by the learned friend above referred to, who suggests, but with doubt, *Keo uro*, and *idris audo*, "that which sweats on being burnt," which may allude to the process of obtaining the Cedar oil, in such high esteem among the ancients; that is supposing the process to resemble that now followed in the Himalaya to extract the *Keloo* oil. Thus *PINUS*, from *pion*, fat. With respect to the word *Juniperus*, my friend quotes the Sanscrit verb *Jun*, to bear, or be born; *Juni*, birth; with which *Juno*, the Queen of heaven, is obviously related in her character of *Lucina*, so also the word *yoni*, all more or less allied to the etymology hinted in the text.

To descend from these cloudy regions of conjecture, the following list of measures of 18 of the largest Cedar trees at Annandale, and 25 of those above the South waterfall, taken at five feet from the ground, may be acceptable; the very superior dimensions, which they attain in the interior, seems to corroborate the idea that the vicinity of the plains is inimical to the growth of this species.

Annandale.				South Waterfall.			
No.	1	feet		No.	1	feet	
—	2	11-0		—	2	14-3	
—	3	10-6		—	3	13-0	
—	4	10-6		—	4	12-10	
—	5	10-6		—	5	12-4	
—	6	10-4		—	6	12-0	
—	7	10-0		—	7	12-0	
—	8	10-0		—	8	11-6	
—	9	10-0		—	9	11-1	
—	10	10-0		—	10	11-0	
—	11	9-9		—	11	11-0	
—	12	9-6		—	12	10-6	
—	13	9-6		—	13	10-6	
—	14	9-0		—	14	10-4	
—	15	8-8		—	15	10-4	
—	16	8-6		—	16	10-3	
—	17	8-4		—	17	10-0	
—	18	8-4		—	18	10-0	
Total,			177-5	—	19	9-7	
Or an average of very nearly 10 ft.				—	20	9-6	
				—	21	9-5	
				—	22	9-4	
				—	23	9-4	
				—	24	8-10	
				—	25	8-7	
				Total,			273-0
				or an average of very nearly 11 feet;			

but of 11, 10-18ths if the first 18 only be reckoned.

The greater size of the trees to the South, which are also at a considerably lower level than the others, is probably due to their greater age: of the Annandale trees No. 1, and of the others, No. 3, seem to be

double or twin trees. I do not know that the latter phenomenon is ever exhibited in the vegetable kingdom, and conclude rather that owing to the extreme closeness with which the young trees spring up, two or more of them have cohered together, towards their root, and each produced its proper stem independently afterwards. Near Deotee, in the Kothee State, to the NE. of Simla, examples of 4 or 5 trees, so bound up into one, are to be seen, a circumstance which, as well as its patience under clipping, before referred to, is very characteristic of the Cedar.

This tree is now being largely introduced into England; but to secure a return of such timber as it supplies in the Himalaya, care must be taken that the ground be thoroughly drained, and when practicable, chosen on the steep declivities of hills, which the tree seems to prefer in its native mountains.—*From the Quarterly Medical and Literary Journal, N. W. Provinces.*

Monthly Proceedings of the Society.

(Wednesday, the 12th November 1845.)

Charles Hufnagle, Esq. Honorary Member, in the Chair.

The minutes of the last General Meeting, and of the Special Meeting of the 17th September, were read and confirmed.

Member Elected.

H. Vansittart, Esq. Superintendent of the Deyrah Dhoon, who was proposed at the last meeting, was duly elected a member of the Society.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :

D. McCullum, Esq. Firm of Mackenzie, Lyall, and Co.—proposed by Mr. Joseph Agabeg, seconded by the Secretary.

Capt. R. Ouseley, P. A. G. G. A. S. W. Frontier—proposed by Col. J. R. Ouseley, seconded by the Secretary.

C. T. Buckland, Esq. Civil Service, Chittagong—proposed by Mr. A. Sconce, seconded by the Secretary.

Lieut.-Col. Alexander Speirs, Resident at Nagpore—proposed by the Secretary, seconded by Mr. John Cowie.

G. Lovell, Esq. (Firm of Revely and Co.) Penang—proposed by Mr. L. Wray, seconded by the Secretary.

B. S. Collins, Esq. Calcutta—proposed by Mr. W. G. Rose, seconded by Mr. Wale Byrne.

Baboo Gungadhur Seal, Calcutta—proposed by Mr. W. G. Rose, seconded by Mr. E. L. Ryder.

Presentations to the Library.

1. Agricola's Tropical Agriculture ; and Observations upon the manufacture of Sugar in the Colonies. *Presented by the Royal Agricultural Society of Jamaica.*

2. The Calcutta Journal of Natural History, No. 23. *Presented by Dr. McClelland.*

3. Journal of the Asiatic Society of Bengal, Nos. 77 and 78. *Presented by the Society.*

4. The India Journal of Medical and Physical Science, Nos. 10 and 11, of vol. 3. *Presented by Dr. Finch.*

Garden and Museum.

1. A collection of Straits fruit-trees, consisting of the Mangos-teen, Rambutan, Dorian, Namnam, Rohan, Rambie, and five other sorts. *Presented by Col. Low, Resident at Penang.*

2. A box containing Nutmeg, Cinnamon, Cacao, Star-apple, Brazil cherry, and a few other varieties of fruit-trees. *Presented by Geo. Gardner, Esq., Supt. of the Royal Botanic Garden at Peradenia, Ceylon.*

In his communication advising the despatch of the above plants, Mr. Gardner intimates his intention of sending by another opportunity a few of the Dwarf and King cocoanuts, and of the green Pine-apple of Ceylon, and expresses his readiness at all times to meet the wishes of the Society to the best of his ability.

Mr. Gardner adds, that he is about despatching to Mr. Vansittart, Supt. of the Deyrah Dhoon, in accordance with the request of the Society, a quantity of Coffee seed selected from the best trees in the Peradenia Garden.

3. A few Indigo-giving plants from the Tenasserim province. *Presented by E. O'Riley, Esq.*

4. A fine supply of Cereal Grains, Hemp, Clover, Rape, Mangulwurz, field Carrot and Turnip, Tares and other *Agricultural* seeds. *Presented by the Court of Directors.*

(Further particulars of this consignment will be found in the body of the proceedings.)

5. A small selection of English Vegetable seeds from Veitch and Sons of Exeter. *Presented by Capt. G. E. Hollings, Secretary of the Agri-Horticultural Society, Lucknow.*

6. Seeds of the Jersey Kail, or Cow Cabbage, of Mummy wheat (*Triticum compositum*), and of Turnip-radish, procured from Mr. Saunders, Nurseryman at Jersey. *Presented by A. F. Smith, Esq.*

7. A few seeds of Melons of sorts. *Presented by Colonel J. R. Ouseley.* Colonel Ouseley mentions that of these Melons, one of the green kinds is a superb variety, the flesh and skin and seed are all green; the rest are also good. The Water Melons, Col. Ouseley adds, are the largest and best he has ever seen.

8. A small assortment of English Vegetable seeds. *Forwarded by Dr. Royle by the August Overland Mail.*

9. A few seeds of the Hibiscus Africanus. *Presented by J. Stikeman, Esq.*

10. Specimens of oils, consisting of Poppy, Sunflower, Safflower, Radish, Cotton, Mawah (*Bassia latifolia*), Hingun (*Ximenia Egyptiaca*) and Cossim (*Schleichera trijuja*); also sample of the Butea Kino. *Presented by C. B. Taylor, Esq. of Palamow.*

In an interesting letter forwarding the above Oils, Mr. Taylor offers a few remarks in reference to two or three of the specimens. He adds, he has been induced to send them with the view of assisting to carry out the wish of the Society, as expressed in its proceedings of last year, namely, to collect, as far "as possible, all the indigenous Edible oils of India, in order to ascertain their comparative qualities, and to improve the manufacture of them, with a view to their becoming in this country equally good substitutes for butter with the Olive oil in the hotter climates of Europe, and preferable for many purposes to any animal oil."

Mr. Taylor's letter was referred to the Committee of Papers.

11. A log of the Yew tree. *Presented by Capt. Percy Eld.*

Capt. Eld states, that this log has been pronounced by Dr. Wallich to be the *veritable* Yew, and he adds, "it was discovered by Mr. Wood and myself in the Naga hills, S. E. of Assam last year. There were only three trees on the hill side, at a height of about 4000 feet. We did not see another throughout the whole of our trip. We searched in vain for young plants or seeds."

Metcalfs Hall.

The subject which first occupied the attention of the Meeting had reference to the Metcalfs Hall. The Secretary mentioned that, with the view of assisting to liquidate at once the amount of the Society's proportion of the debt on the Building, (6000 Rs.) four of the mem-

bers, namely, Rajah Suttchurn Ghosaul, Baboo Ramgopaul Ghose, Dr. Hufnagle, and Mr. Rustomjee Cowasjee, had consented to advance as a loan, without interest, the sum of 3000 Rs.; the two former gentlemen one thousand each, and the two latter, five hundred each; whereupon the following notice of motion for the next General Meeting was given by Mr. Staunton, seconded by Dr. Hufnagle:

“That the Society having undertaken to pay Rs. 6000 as its share of the debt due on the Metcalfe Hall, and four members of the Society having volunteered a loan of 3000 Rs. for two years without interest, the Secretary be authorised to borrow the balance, Rupees 3000, on deposit of Company's Paper belonging to the Society, the said sum to be replaced out of the additional subscriptions, recently agreed to and after payment to, the members who have advanced the 3000 Rs. as above mentioned.”

The Secretary also laid on the table a list of subscriptions received during the past month, amounting to Rs. 350, towards the same object. The principal part of this sum, he observed, had been contributed in the shape of *donations*, by about one-third of the number of the Society's life subscribers, who, as such, are exempt from the additional temporary subscription, agreed on at the late Special Meeting; while the remaining portion had been made up by a few other members having paid their additional proportion in advance.

In connection with this subject, the Secretary read a letter from Sir Lawrence Peel, in reply to his (the Secretary's) letter forwarding copy of the Resolution of the Special Meeting expressive of the Society's acknowledgment to Sir Lawrence for his handsome donation towards payment of the debt on the Metcalfe Hall. Sir Lawrence observes, “In making this donation, I was mainly influenced by a desire to aid the funds of a Society which has done, and is doing, much good, and whose future exertions in the same direction might have been crippled if resort had been had to the small balance in favour of the Society. I did not look for the reward which I have received, and for which I offer the Society my warmest acknowledgment.”

The Secretary mentioned, that an application had been made to him by several gentlemen connected with the private subscription

Concerts, of which there are four during the cold season, to know whether it were possible to allow them the use of the Society's large hall for their entertainments and for fortnightly practice. After some little conversation it was agreed, that the hall might be lent for the purposes in question, subject to the permission being revoked in the event of any inconvenience arising therefrom.

Horticultural Exhibition.

A list of the prizes, amounting to 86 rupees, which were awarded at the show of Vegetables and Fruits, held on the 24th of October, was next submitted. In the remarks appended to the list it is mentioned, that this exhibition was not so good as that held in October of last year. The heavy falls of rain experienced during the first half of the month, most probably had an injurious effect on most of the esculents, and caused a later season than that of 1844. The best specimens, it is stated, consisted of turnips, carrots, leeks, onion, lettuce, endive, cabbage sprouts, asparagus, tomato, and French beans. Of potatoes there were only three baskets, and a like number of celery, with a scarcity of beet, and not a single specimen of peas.

Among the fruits the best specimens were those of custard-apples, pomegranates, sapotas, pine-apples and pumplenoe. The assortment of indigenous vegetables was tolerably varied.

Nursery Garden.

A report from the Garden Committee was next read. The Committee allude to the circumstance of thirty thousand canes having been distributed from the Nursery during October, and applications for ten thousand more having been registered. They refer to the great demand for the China and Singapore varieties, and to their inability to meet them; and state that they have taken measures to increase the cultivation of these two sorts considerably, with the view of meeting a probable large demand next season. The Committee next refer to the progress making in the fruit-tree Nursery, and to the receipt since their last visit, of small consignments from Penang and Ceylon; (as detailed under the head of "Presentations to the Garden") the former in tolerable good order, and the latter in excellent condition.

They suggest the erection of a small conservatory, at an expense not exceeding 85 rupees, immediately adjoining the flower garden, and refer to a few other matters of minor importance connected with the improvement of the garden. The report of the Committee was confirmed.

Provision for Garden and Flower Seeds for 1846.

The Secretary submitted a memorandum, suggesting that an equal amount to that voted for garden and flower seeds for 1845, be again allowed to meet the cost of consignments for next year ; when it was proposed by Mr. Staunton, and agreed, that the sum of Rs. 3,500 be reserved for that purpose, and that it be left to the Garden Committee to arrange the details, and report the result at the next meeting of the Society.

Vernacular Hand-book of Agriculture, Horticulture, and Farming.

A letter was read from Mr. Fenwick, announcing the completion of his Hand-Book of Agri-Horticulture ; Mr. Fenwick states, that the delay in re-submitting it has been occasioned “ by the revisions it has undergone in conformity to the suggestions of the learned natives, to whose inspection it was successively submitted.”

It was agreed, previous to making any arrangements for the printing of the work, to transmit the MSS. again to Mr. Tucker, with the view of ascertaining if the work, in its present revised state, has been drawn up in accordance with his suggestions, and if, in other respects, it fully meets his approval.

Julalya Wheat and white Linseed from the Nerbudda.

The Secretary informed the members, that since the announcement at the last meeting of the receipt of the fine supply of Wheat and white Linseed from the Nerbudda valley, obtained through the kind assistance of Col. Ouseley, he had received the following reply to a communication which he had addressed that gentleman, requesting to be favored with the particulars of the cost of the same : “ It gives me much satisfaction to find you are pleased with the supply of wheat and linseed to which you allude in your's of the 4th September. There is nothing to pay for it, as I am only too happy to be instrumental in bringing to general notice such valuable staples.”

Resolved,—That the best acknowledgments of the Society be tendered to Col. Ouseley for this useful and handsome present.

Donation by the Court of Directors of a large supply of Agricultural Seeds.

Two communications from Professor Royle, respecting the consignment of cereal grains and other seeds referred to among the presentations, were next submitted. Professor Royle intimates, that this fine and acceptable supply of seeds has been presented by the Court of Directors of the E. I. Company, in compliance with their promise to the Society of occasionally sending out seeds of an useful nature, and as the present assortment, though sent by ship, has received much attention at the hands of Messrs. Wrench, to whom the order was given, he hopes to hear a favorable report regarding them.

The Secretary stated, that the seeds had arrived in excellent condition outwardly, and he had lost no time, after their receipt, with the view of saving the season, in despatching portions of them to members of the Society at Bhauglepore, Patna, Mirzapore, Gorruckpore, Tirhoot, Rungpore, Dinagepore, Benares, Allahabad, and such other quarters as he thought most desirable; besides meeting applications from several parties resident in lower Bengal.

Communications on various subjects.

The following papers and letters were also submitted :

1. From J. Thornton, Esq. Secretary to the Government N. W. Provinces, placing at the disposal of the Society, by direction of the Hon'ble the Lieut.-Governor of the N. W. P., a copy of Dr. Jame-son's report on the tea experiments now being carried on in Kumaon and Gurhwal.

2. From R. Dodd, Esq., submitting his promised note on the mode of preparing madder.

These two communications were referred to the Committee of Papers.

3. From G. A. Bushby, Esq., Secretary to the Government of India, intimating, with reference to the Society's application of 23rd February 1844, that the Court of Directors, are arranging to send annual supplies of seeds to the Society by steamers, but at present

the great charge of freight will oblige them to send consignments by sailing vessels.

4. From the same, enclosing copy of a letter from the Secretary to the Government of Ceylon, in which is preferred a request for Carolina paddy, and asking if the Society can meet it.

The Secretary mentioned, he had replied to this letter to the effect that the Society had no seed in store, but that probably a small portion might be reserved from the large consignment expected in March next, and which had been ordered by Government on the representation of the Commissioner of Arracan.

5. From C. Beadon, Esq., Under Secretary to the Government of Bengal, applying for twenty ounces of silk-worms' eggs for transmission to the Government of Bombay.

The Secretary stated, that arrangements were being made to meet this application.

6. From H. Piddington, Esq., annexing the following extract of a letter to his address from the Honorable Sir Edward Ryan, regarding his (Sir Edward's) picture :

" The Picture for the Agricultural Society still remains unfinished. Mr. Say, as you have probably heard, has been for a long time so unwell as not to be able to paint, indeed I thought he would not live, and still think his life very precarious. However, he says it will be done by the beginning of next year ; the face has long been painted, and the rest of the picture alone requires his care, and it can always be done without me whenever he is able to work ; pray, explain this to the Committee."

7. From Capt. S. F. Hannay, Commandant Assam Light Infantry Battalion, dated Jeypore, Upper Assam, 15th September 1845. Capt. Hannay intimates his desire to correct the statement made by Dr. McClelland, and incorporated in the published Proceedings of the general meeting of the Society, held on the 13th August, in reply to his (Capt. Hannay's) former communication, pointing out that the assertion made by Dr. McClelland in his memoir of Dr. Griffith, at page 32 of the present volume of the Society's Journal, was an erroneous one ; namely, " that the Nagas were in the habit of decapitating whole guards of the Assam Light Infantry while they were asleep."

Having offered a few preliminary remarks, Capt. Hannay observes, as follows :

“ With regard to Dr. McClelland’s allusion to the attack made on the station of Suddyah in 1839, and the death of the late Lieut. Colonel White, I cannot see that he has done any thing else than shewed further inacquaintance with Assam affairs, which need not have been displayed, had he given himself a little trouble to gain better information than he seems to be possessed of. I now consider it necessary to state, for the information of the members of the Agricultural and Horticultural Society, that the attack made upon the head-quarters station of the A. L. I. was the result of an insurrection of the revenue-paying population—Khamptis, and others residing in the district of Suddyah in the plain of the Burrumpooter, who had become disaffected in consequence of being taxed, and having lost their slaves. These people were in the daily habit of visiting the cantonment for years before, their villages being but a few miles distant. The attack was long thought of, well planned, and made the advantage of the most consummate treachery at an hour when every one was supposed to be asleep excepting the guards of the station. The object, (Suddyah being a very isolated and remote position,)—the destruction of our military resources in Upper Assam,—(the whole of the arms and accoutrements being kept in buildings composed of the most inflammable materials,) and thus causing risings and plundering on every side until assistance could have been obtained from Bengal. Happily, however, although there was good cover for an attacking party within a few hundred yards of the different guards, the assailants, from 600 to 800 in number, were repelled at every point, within 15 minutes after the attack, by about 50 men, including the whole of those on duty at the time.

“ My late respected and gallant Commandant, Lieut.-Col. White, lived in a remote corner of the cantonment without a guard, and on the first alarm appears to have got up, put on a surtout coat over his night dress, and with his sword in his hand proceeded in the direction of the station magazine. He had scarcely, however, gone one hundred yards from his own house when he came upon 20 to 30 of the enemy, who immediately recognized and attacked him. Colonel White bravely defended himself for some time, wounding one of his

assailants in the hand, but was eventually overpowered, having received both a shot and spear wound through the back, and a severe cut, about two inches deep, on the left side of the neck: this, however, does not amount to decapitation, as stated by Dr. McClelland. The party who committed this murder were well known; and apparently terror-stricken at the magnitude of their crime, immediately fled. The body was found by the Sergeant-major of the corps, on his way to the parade a minute afterwards.

"To shew also that the troops, however much taken by surprise, were not inclined to lose their heads, the assailants left 26 bodies behind them, in and about cantonments, most of them having been killed in the vicinity of the guard. My own sentry promptly loaded, fired, and killed one of the attacking party on my bungalow, and without doubt, saved my life. The sentry (outlying) of the rear guard behaved as promptly, but was afterwards cut down. The bugler at the magazine guard, (which was also a jail with 16 chained prisoners in it,) was cut down in the act of putting the bugle to his lips to sound the alarm, by a man who was instantly bayonnetted by a sipahee of the guard. I also saw four sipahees kill as many of the assailants, not 15 yards from where I stood at one of the bells of arms, scarcely two minutes after the first alarm, a position where there was only one sentry before the attack. The greater portion of our killed, ten in number, were of those not on duty; and here the Subadar-major of the corps at his own threshold, in defending himself against numbers, next to decapitated an antagonist before he fell himself. These and other instances which I could give, are I hope sufficient to shew Dr. McClelland, that a *wholesale decapitation* of disciplined troops is not so easily effected, as he seems to think, as well as to point out to the members of the Society how unwarranted and uncalled-for are his published statements regarding the Assam Light Infantry Battalion.

"I arrived in Assam very soon after the Tea commission left it, and up to this date have travelled in various directions amongst the different hill tribes. I must say, however, I feel quite at a loss to discover where this Tea commission could have reached the point in the Naga hills 20 miles beyond the Assam frontier. The very ferocious Naga tribe mentioned by Dr. McClelland ought, I think,

to be named. With regard to the Nagas generally, although *as fait* at decapitation amongst themselves, and in the plunder of defenceless villages in the plains (in days long gone by) they have, and particularly the tribes near the scene of the travels of the adventurous Tea commission, a wholesome dread of the sound even of a musquet.

"It may be as well to add, that Suddyah is about 120 miles to the North and East of Gabra Purbut, a tea locality mentioned by Dr. McClelland, under the hills. The tribes in the hills near Suddyah are called Abors and Mishmees. These have never made themselves particularly obnoxious to the British Government; gangs of Mishmees, men and women, smoking their short pipes, may be seen all over the Upper Assam plains in the cold weather, and the same may be said of the Nagas nearest the Assam valley, on a line of frontier extending upwards of 120 miles, many of the tribes being regular traders.

"I shall now conclude this rather lengthy epistle, by again requesting, that the statements put forth in the Journal of the A. and H. Society, viz. 'that the Nagas were in the habit of decapitating whole guards of the Assam Light Infantry while they were asleep,' may be contradicted in the most public manner possible."

8. From Captain Gabb, Secretary Madras Agri-Horticultural Society, applying for a copy of the rules and regulations of this Society's Cattle Shows, as a guide to them in their contemplated establishment of exhibitions of a similar nature.

9. From Col. H. C. M. Cox, dated Jubulpore, 13th October, intimating that teak grows in great abundance throughout the whole tract of country east of Jubulpore, both on the banks of the Nerbudda and Sone rivers. Col. Cox states, "perhaps it would be worth while testing the strength of the Sone and Nerbudda teak with that of Malabar and Rangoon; I can easily send you samples if you wish it."

Col. Cox adds, "I tried sometime since Col. Stacy's plan [published in a late number of the Journal] of having cuttings sent by dawk banghy packed in the stem of a plantain, and I have great hopes it will succeed: out of 38 cuttings, 30 were alive when I received them from Barrackpore, and I trust most of them will soon put out shoots."

10. From Capt. W. W. Dunlop, Secretary Cuttack Branch Society, applying for the annual donation of 50 Rupees from the Parent Society. Captain Dunlop adds, "I shall not ask you for medals this year, as the two which you were so kind as to send me last year were not given away, but reserved for this year."

Letters were also read from the Secretaries of the Royal Agricultural Society of Jamaica and the E. I. and China Association, and from the Secretary to the Society of Arrarat; all returning thanks for the Journals and Transactions of the Society.

For all the foregoing communications and presentations, the best thanks of the Society were accorded.

(Wednesday, the 10th December, 1845.)

The Honorable Sir J. P. Grant, President, in the Chair.

The minutes of the last General Meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last meeting, were duly elected members of the Society, viz. :

Messrs. D. McCullum and C. T. Buckland, Captain R. Ouseley, Lieut.-Col. Alex. Speirs, Messrs. G. Lovell and B. S. Collins, and Baboo Gungadhur Seal.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :

Thomas Watkins, Esq. Raneegunge Collieries, Burdwan, proposed by Dr. Wallich, seconded by the Secretary.

William Cockburn, Esq. Raneegunge Collieries, Burdwan, proposed by Dr. Wallioh, seconded by the Secretary.

G. M. Gasper, Esq. Calcutta, proposed by Mr. Joseph Agabeg, seconded by the Secretary.

Presentations to the Library.

1. Journal of the Royal Asiatic Society of Great Britain and Ireland, Part 1, No. 16. *Presented by the R. A. Society.*

2. Journal of the Asiatic Society of Bengal, No. 79. *Presented by the Society.*

3. India Journal of Medical and Physical Science, No. 12, of Vol. III. *Presented by Dr. Finch.*

4. Proceedings of the Sixteenth Anniversary Meeting of the Society of Natural History of Mauritius. *Presented by the Society.*

5. Three copies of Voigt's "*Hortus Suburbanus Calcuttensis.*" *Purchased by the Society.*

Garden and Museum.

1. A fine collection of Mango, Loquat, Guava, Pears, Apples, Figs, Peach, Grape, Vines, and other fruit trees ; also a small assortment of flower plants. *Presented by Capt. G. E. Hollings, Secretary of the Lucknow Agri-Horticultural Society.*

The Secretary intimated that, with the exception of a couple of Vines and a few Strawberry plants, the whole of this fine collection had arrived in excellent condition, and been transferred to the Garden Committee. It was directed, that the best thanks of the Society be given to Capt. Hollings for this acceptable supply.

2. A variety of Egyptian Melon seeds, one kind of Wheat and Lupin seeds, and a species of Bean ; also two Date trees, (male and female.) *Presented by Dr. Henry Abbott, of Cairo.*

3. A small quantity of Upper Egyptian Wheat, a few Pear seeds from Mount Sinai, and some of the Beans used for feeding cattle in Egypt. *Presented by Lieut. E. J. Robinson, Supt. of the Bhuttee Territory.*

4. A few plants from the Straits, consisting of the conical Pine-apple, dwarf Cocoanut, Attap, and Chokermanis. *Presented by Dr. K. M. Scott.*

5. A box of seeds and bulbs from South Africa. *Forwarded by the Rev. David Livingstone, at Lattakoo.*

The Secretary mentioned, that at the suggestion of Dr. Wallich, the contents of this box had been divided between the Botanic Garden and the Society's Nursery for immediate operations.

6. A supply of Coffee, the produce of his garden at Chittagong. *Presented by A. Sconce, Esq.*

7. A second specimen of Madder root, the growth of the Botanic Garden at Sewneri. *Presented by Dr. Alexander Gibson, Supt. H. C. Botanic Garden of Western India.*

Dr. Gibson states, that this specimen has been more carefully dried than that previously sent, which will admit of a better judgment

being formed of its quality. Dr. Gibson promises to send a quantity of seed so soon as he has collected it.

8. ' A box of Sydney Maize. *Presented by Captain Townley, Commander of the "Orwell."*

9. Six varieties of Dahlias and five of Crysanthemums, the produce of his garden. *Presented by Mr. R. Wood, Junior.*

These cut specimens were much admired by the meeting for their extreme beauty.

Metcalfe Hall.

The motion, of which notice was given at the last Meeting to the effect, that,—“ The Society having undertaken to pay Rs. 6000 as its share of the debt due on the Metcalfe Hall, and four members of the Society having volunteered a loan of 3000 Rs. for two years without interest, the Secretary be authorised to borrow the balance, Rs. 3000, on deposit of Company's Paper belonging to the Society, the said sum to be replaced out of the additional subscriptions recently agreed to, and after payment to the members who have advanced the 3000 Rupees as above mentioned,”—was first brought forward, and duly agreed to.

Provision for Garden and Flower Seeds for 1846.

The following report from the Garden Committee, regarding consignments of vegetable and flower seeds for the year 1846, was next read :

In accordance with the Resolution of the last General Meeting, “ That the sum of 3,500 Rs. be reserved for garden and flower seeds for 1846, and that it be left to the Garden Committee to arrange the details and report the result at the next meeting of the Society,” your Committee beg to state the mode in which they have endeavoured to meet the wishes of the Society, as arranged at a meeting held on the 17th November.

Flower Seeds from England.—Taking into consideration the great disappointment experienced this year in the seeds received from Messrs. Veitch, of Exeter, and Messrs. Carter, of London, and referring to the excellent condition in which the consignment of Agricultural seeds sent out by Messrs. Wrench and Sons, of London Bridge, by direction of the Court of Directors, has reached the So-

ciety ; your Committee have indented on that firm, through the Secretary, for a choice assortment of flower seeds, sufficient to be subdivided into 400 packets. The said consignment to arrive here, if possible, in all May, or not later than June, and the cost not to exceed £ 60, or Rs. 600.

Vegetable and Flower Seeds from America.—The vegetable and flower seeds forwarded this season by Messrs. Landreth and Muns, of Philadelphia, having again given satisfaction—so far as your Committee have been able to ascertain—they have requested the Secretary to direct that firm to send another consignment, to consist of 400 packets of flower seeds and 500 packets of vegetable seeds, being one hundred packets of the latter in excess of the supply for 1845. With the view of enabling Messrs. Landreth and Co. to meet this extra demand, and to send a much larger quantity of peas and beans, a choicer collection of flower seeds, and a larger quantity of each variety ; and, in fact, to render the consignment in every respect more acceptable to the members, your Committee have authorized them to draw on the Society for 200 dollars in excess of their last bill, which will make the present bill equal to 1,650 Rs. The consignment to reach this in all July.

Vegetable Seeds from the Cape.—In consequence of the garden seeds received this year from Messrs. Villet, of the Cape, having proved very unequal, and altogether inferior to the supplies usually sent by them, the Committee have been induced to suggest that only 400, instead of 500, packets be sent next season, to arrive here in May or the early part of June ; and to inform the Seedsmen, that upon the result of this consignment will depend a continuance of the Society's patronage. This order to Messrs. Villet is limited to 1,200 Rs., making, with the cost of the supplies from England and America, in the aggregate, Rs. 3,450.

In conclusion, your Committee have the pleasure to append to this Report copies of the several lists transmitted for the guidance of the Seedsmen, and trust that the selection and quality of the seeds distributable during next year may give satisfaction to the Society in general.

(Signed) RICHARD DODD.

WM. G. ROSE.

Exhibitions of Flowers, Vegetables, and Fruits.

Another report from the Garden Committee presenting a schedule of prizes, amounting to Rupees 150, to be awarded at the fourth and last exhibition of flowers for the current year, was also submitted. The Committee suggest, that the show be held on Tuesday, the 30th of December, at 11 A. M. This was agreed to, and it was further resolved, that the first show of vegetables and fruits for the year 1846, take place on Monday, the 2nd of February, and the anniversary dinner on the evening of the same day.

Vernacular Hand-Book of Agriculture, Horticulture, &c.

A communication from H. Carre Tucker, Esq. the Collector of Goruckpore, returning Mr. Fenwick's revised work, was next brought to the notice of the meeting. Mr. Tucker states, that the general opinion of the respectable natives of Goruckpore is favourable to the work, both as to the matter and manner; and that he himself thinks it is much improved by the revision which has been given to it; is likely to be useful, and does great credit to the author.

Resolved,—That the work be referred to the Committee of Papers, to make the necessary arrangements in regard to printing, &c.

Progress of the Bhauglepore Branch Agri-Horticultural Society.

The paper next submitted was a letter from Major Napleton, Honorary Secretary of the Branch Society at Bhauglepore, communicating the pleasing intelligence of the progress of that association, in the shape of a report of a meeting held at the station on the 14th ultimo. Among other gratifying items, the report states that thirty-eight new subscribers have been added to the list since the 30th of May last; that the donations during the year amount to Rs. 293, exclusive of the annual donation of the Parent Society of two silver medals and 50 rupees; that there have been several presentations of plants, seeds, &c., and the balance in favor of the Society, after paying all demands, amounts to Rs. 416. The report was transferred to the Committee of Papers for the next number of the Journal.

Communications on various subjects.

1. From F. J. Halliday, Esq. Secretary to the Government of Bengal, submitting copies of further correspondence connected with the Government Cotton Experiments at Dacca.

2. From L. R. Reid, Esq. Secretary to the Government of Bombay, forwarding a Memorandum, with plates, drawn up by Dr. Burn, Superintendent of the Government Cotton Experiments at Broach, explanatory of an experiment made by him in crossing the indigenous Cotton plants of India.

3. From J. W. Laidlay, Esq. presenting a Memorandum on the fertilizing properties of the well-water of Calcutta.

4. From J. McClelland, Esq. presenting a Note on the Kang Punneah Naga tribe.

5. From G. T. Lay, Esq. H. B. M. Consul at Amoy, giving a few items of agricultural information connected with the Island of Koolangsen.

The above five communications were transferred to the Committee of Papers.

6. From J. Forsyth, Esq. Secretary to the Medical Board, furnishing copies of communication from the Surgeons of the General, Native, and Medical College Hospitals, to the effect that no opportunities of testing the supposed virtues of the root of the *Cissempeolos convolvulacea* as an antidote to poisonous snake-bites, have yet been afforded.

7. From Captain Barr, Secretary of the Agricultural Society of Bombay, intimating, with reference to a promise made some time ago, that no papers of sufficient interest for publication in the Journal of the Agricultural Society of India have been received by their Society up to the present time.

8. From Captain Gabb, Secy. of the Agricultural Society of Bombay, acknowledging the receipt of a supply of *Agricultural* seeds sent by this Society; Capt. Gabb gives a list of the parties among whom portions of this supply have been distributed, and promises to communicate the results of their experiments in due course.

For all the above communications and presentations the best thanks of the Society were accorded.

JAMES HUME, *Hon. Secy.*

**Report of the Agricultural and Horticultural Society of India, for the
year 1845.**

Following the example set in 1835, and acting on the hope then expressed that a similar summary would be given at the close of each year, the Society has now the pleasure to submit, in its Eleventh Annual Report, the following brief outline of its proceedings during 1845.

And first, commencing with the more immediate concerns of the Society, as connected with its internal economy, it may be mentioned that since the close of the last year, there has been an accession of Fifty new Members. Of these nine are Civilians, in the service of Government, fifteen are Medical and Military Officers, two are Indigo Planters, one is a Minister of the Gospel, twenty-one are Mercantile, and two are of the Legal profession. The loss from resignations has been exactly the same as that of last year, but less by deaths.* There have been nine deaths, and thirty-four resignations, besides seven whose names have been removed from the list, five on account of insolvency, and two (Mr. F. A. J. Elson and Baboo Woomeschunder Roy) for non-payment of subscriptions; in all fifty.

The following tabular statement in continuation of those in former reports, affords full details, and represents, at the same time, an analysis of the constitution of the Society :—

	In 30 former years.	In 1841.	In 1842.	In 1843.	In 1844.	In 1845.	Gross Total.	Total real num- ber at the close of 1845, after de- ducting lapses.
Honorary Members,	8	2	0	1	0	0	11	9
Free Members,	0	0	1	0	1	0	2	2
Civilians, in the service of Government, ...	152	19	21	14	17	9	232	164
Merchants and Traders,	129	13	18	16	10	15	201	129
Indigo and other Tropical Agriculturists, ...	139	21	7	15	6	3	190	89
Military Officers,	102	21	4	16	4	13	160	97
Medical ditto,	54	10	9	1	4	2	80	33
Asiatics,	37	8	6	5	1	6†	63	38
Clergy,	10	1	1	3	0	1	14	3
Law Officers,	28	0	6	2	2	2	40	25
Miscellaneous,	5	0	2	0	2	0	9	5
	664	95	75	71	47	50	1002	594

* Since this was written, the Society has had to lament the loss of three more Members, viz :—Major G. Broadfoot, Captain P. Nicolson, and Captain D'Arcy Todd, who fell at the battles of Moodkee and Ferozeshuhur, on the 18th, 21st and 22nd December.

† All these are engaged in mercantile pursuits.

Of this number thirty-eight are Members who have compounded for their subscriptions; one hundred and twenty-four are absent from India, nine are Honorary, and two are Free Members; leaving four hundred and twenty-one as the actual number of *paying* Members on the books of the Society, or twelve less than last year. This small decrease arises, not from the circumstance of the total number of Members on the list being less than that of last year, but in consequence of the departures to Europe, many of them temporary, being greater, and the returns not having been in a proportionate ratio; added to which it may be observed that, by a late regulation of the Society, Members while resident at the Cape (of whom there are five at present) are likewise absolved from payment of subscription till their return to India.

The Society cannot quit this subject without the expression of its regret that, while in the elections of the year, Merchants and Traders are represented by the goodly comparative number of twenty-one, and while all other Members of the community bear a tolerably fair proportion, *two only* of so respectable a class as the Indigo Planters should have joined its ranks during that period. Should such be the case, when it is considered that this section is more closely connected with the objects of the Society than perhaps any other? Should it not rather naturally look to them, before all others, for that support which the nature of their pursuits so well enables them to bestow? The Society would indulge the hope that this body will, during the next year, not allow a similar remark to be made, but that they will rally round an Institution which should derive its principal assistance in every way from the Indigo Planter and other Tropical Agriculturists.

Among the calamities which have befallen the Society by the hand of death, the loss of the late Mr. William Griffith, one of its Vice-Presidents, has been the most severe. The Society has already recorded its sense of the loss it, as well as the science of Botany, has sustained, in the demise of so valuable a Member. The memoir from the pen of Dr. McClelland, published by the Society in the present volume of its Journal, and the tribute to his memory in the report of the last Anniversary Meeting of the Royal Asiatic Society, have assisted in bringing to

more prominent public notice the labors of this most eminent, original, and indefatigable Botanist. In this Report it is now only left us to repeat, with feelings of deep regret, our sense of the amount of information which has been lost to the scientific world by the premature demise of this distinguished Member.

The other Members who have been lost to the Society, are Mr. E. S. Hodges, Indigo planter ; Mr. James Pattle, of the Civil service ; Mr. Alexander Holmes, Merchant ; Mr. F. J. Morris, of the Civil service ; Major Delafosse, of the Artillery ; Messrs. L. J. H. Grey, and E. V. Irvin, both of the Civil service ; and Dr. James Morton, of the Medical service.

In the last Report allusion was made to the formation of a Special Committee in reference to some prominent Sugar Duty Question. steps being taken by the Society for the purpose of representing the interests of India in the proposed changes by the British Parliament, during the session of 1845, of Custom Duty on East-Indian grown and other Sugars. As this was the first subject of importance which engaged the attention of the Society in the opening of the year, it may be proper to allude, before passing on to the consideration of other matters, to the result of the labors of the Committee in this respect. The report and draft of a petition* drawn up by the Committee were, in the first instance, submitted at the General Meeting in January, and referred to a Special Meeting held in the following week, at which the draft was agreed to, though not unanimously, and subsequently circulated to about 100 of the resident Members, (the approaching departure of the mail not admitting of a more extended circulation) signed by 70 or thereabouts, and then transmitted, as previously agreed on, to the E. I. and China Association. At the May Meeting a reply from Mr. Stikeman, Secretary of the Association, was read, intimating that the petition had arrived most opportunely, and been entrusted to the care of Mr. Hogg, in the House of Commons, who presented it on the 17th March, and to Lord Monteaule in the House of Lords. The details of the "Sugar Bill," which was read for the third time in the Commons' house of Parliament, and passed on the following day, and the conse-

* This draft and the minutes of the Members in detail will be found in the Fourth Volume of the Journal.

quent decreased scale of duty on certain descriptions of Sugar, the growth of any British possession within the limits of the E. I. Company's Charter, imported into the United Kingdom, are too well known to need a repetition in a summary of this nature.

The circumstance of a renewed application to the Court of Directors for occasional supplies of Agricultural and other seeds of an useful nature, to be placed at the disposal of the Society, in virtue of a promise to that effect given by the Court three years previously, was also referred to in the last Report. The Society has now the pleasure gratefully to record that, in conformity with this promise, the Court has been pleased to transmit a fine assortment of Cereal and other seeds, such as mangul-wurzel, tares, rape, clover, flax, hemp, field-carrot, and turnip.* This supply reached in October,

* In justice to Messrs. Jacob Wrench and Son, of London Bridge, to whose care the preparation of this consignment was entrusted, it may here be remarked that the seeds arrived in most excellent outward condition. The following extract of a letter from Major Napleton, dated Bhaugleapore, 6th Nov. acknowledging receipt of the first despatch for the use of the Bhaugleapore Branch Society, and for general distribution in the district, may also be quoted as corroborative of the above observation:—

"I have now the pleasure to acknowledge the receipt of two boxes of wheat, barley and clover, being a present from the Parent to our Branch Society, for which I am directed to tender our best thanks. I beg to add, that the five bags of wheat have arrived here in excellent order, so much so that it would be difficult to find seed wheat in such fine condition in the hands of the most careful Zemindar or Agriculturist. The same remark is applicable to the barley and clover. The five sorts of fine wheat, together with the barley and clover, shall have spots of ground allotted for their reception in our Agricultural department, and every care taken in weeding, &c. until harvest time, and I shall make a full report to you as to how each batch turns out, numbering them from one to seven under their respective denominations.

"It is my present opinion, that one and all will turn out remarkably well, and prove a boon to our district. I observe your intention of forwarding us a further supply of cereals, and I can promise you that there are many enterprising Agriculturists in this, and the neighbouring districts, who will be too happy to give them a trial in the soil of their respective farms."

Mr. H. C. Tucker, in a letter under date 14th Dec. writes, "I have received and distributed widely the boxes of seeds, which were mostly in beautiful order. You shall hear how they succeed in different places and hands."

Capt. Hollings also remarks,— "The wheat and other seeds reached me apparently in good order on the 13th instant" (December.)

and was immediately distributed over various parts of the country.* The Society will give the result of this distribution in the next yearly summary, now merely expressing the hope that it may be of a sufficiently favorable nature to induce the Court to despatch similar supplies annually, with the view of assisting to improve the Agricultural capabilities of the country.

It was likewise mentioned in the last year's summary, that a sum of £ 20 had been voted for a small consignment of fine seed corn from Launceston and Sydney, and also a small sum for the provision of Madder seed from the South of France. The Society states, with regret, that the former consignment was unfortunately lost by the wreck of the *Hydrabad*. The Madder seed (two maunds) was received in May in good germinating condition,† and was distributed, shortly after, in parts of the country supposed to be the best adapted for the culture of the plant. The Society has not, up to the present time, received all the returns, but so far as its information extends, the experiments have been very unsuccessful, the seed having, in nearly every instance, failed to vegetate. It is probable, from this untoward result, that the seed was injured *in transitu*, although it was carefully packed and despatched to all the localities by the most speedy mode of conveyance. Thus, for the present, has the object of the Society for the introduction of this plant, as a substitute for Munjeet, been frustrated. To Colonel Ouseley the Society is again indebted for a second fine supply of the white linseed and Julalya wheat of Central India, the

* Besides meeting applications for a limited quantity of these seeds, large supplies have been sent to the following gentlemen for distribution in their respective districts :

Major Napleton, Secretary Agricultural and Horticultural Society of Bhaugle-
pore,—E. C. Ravenshaw, Esq. Commissioner of Patna,—H. C. Tucker, Esq. Col-
lector of Gorruckpore,—M. C. Ommaney, Esq. Collector of Customs at Mirza-
pore,—D. F. McLeod, Esq. Magistrate and Collector of Benares,—R. Lowther,
Esq. Commissioner of Allahabad,—J. O. B. Saunders, Esq. Allahabad,—Captain
G. E. Hollings, Secretary Agricultural and Horticultural Society of Lucknow,—
James Grant, Esq. Collector of Dinagapore,—H. Rehling, Esq. Rungpore,—J.
W. Yule, Esq. Tirhoot,—the Secretary Agricultural Society, Madras.

† Many plants were raised from this seed in the Society's Nursery garden, and a few of them are still on hand.

great demand for which, but particularly the former, was alluded to on a former occasion. Its thanks are also due to Dr. Wallich for having placed at its disposal a quantity of seed of the American Sumach, or Divi-divi, (*Cæsalpinia coriaria*) the produce of the H. C. Botanic Garden. The valuable properties of this plant for tanning purposes are now beginning to be fully appreciated, and its culture will, in all probability, be generally extended throughout the country. From Dr. Robert Wight, at Coimbatore, the Society has also received and distributed a supply of *Nerium tinctorium* seed. The leaves of this tree have long been known as affording a superior description of indigo, but its cultivation on this side of India appears to have been altogether neglected in favour of the well-known indigo of commerce, the produce of the *Indigofera tinctoria*. Some interesting information on this subject, from Mr. Taylor of Palamow, and Mr. Fischer of Salem, will be found in the present volume of the Journal.

In connection with this department, and as a matter of record, it may be here remarked, that the Government of Bengal have taken steps to carry out the recommendation of the Society, and of Major Bogle, the Commissioner of Arracan, as noted in the last Report, for the obtainment of 500 maunds of Carolina paddy, to reach this in March 1846, with the view of introducing this superior description of rice, on a large scale, into that province, so aptly designated "the granary of Bengal."

The improvements and additions to the Nursery, to which allusion
Nursery—Orchard was made in the last summary, have been car-
and Flower Garden. ried out during the year under the superin-
tendence of the Garden Committee. Mango and other fruit trees of
superior varieties have been procured from Malda, Lucknow, Madras,
Bombay, Ceylon and the Straits. These supplies have materially
assisted towards stocking the portion of ground appropriated for
an Orchard, for the express purpose of enabling Members of the
Society in due course to obtain grafts of choice trees. To Capt.
Hollings, the Society is under great obligations for the fine assort-
ment of fruit-tree grafts which he has so kindly supplied from the
Garden at Lucknow; also to the Bombay and Madras Societies, and
to Mr. Gardner, Superintendent of the Royal Botanic Garden at

Paradise, Ceylon. The Society is likewise indebted to Sir Lawrence Peel for a supply of flowering shrubs and plants, presented for the purpose of stocking a portion of the Nursery, about two beegahs, which has been formed into a flower garden with the same object in view as has influenced the formation of an Orchard. A sum of money has been voted for the laying down of walks throughout this piece of ground, and for the erection of a small conservatory adjoining thereto. Both these improvements will be completed in the early part of 1846.

The Society has the pleasure to state that the distribution of
Nursery.—Sugar Cane Sugar cane this season has far exceeded that of culture. the three previous years. Upwards of 36,000 canes have been disposed of, leaving a stock of about 10,000 to meet any further demands during January and February of next year. The greater proportion of cane this season consists of the Otaheite kind, but in consequence of an equally great demand for the China and Singapore varieties, the Committee have taken steps to increase the cultivation of both these sorts considerably, to meet another probable large demand next season. It is gratifying to add that the return from the canes already disposed of has met three-fourths of the ordinary expenses of the garden.

Simultaneously with the above the culture of various other useful
Nursery.—Useful cul- products, for the seeds and bulbs of which there tures. is generally a steady demand, has met with attention at the hands of the Committee; among these may be enumerated guinea grass, tobacco of superior sorts, the Brazilian and Tenasserim yams, ginger, arrow-root, Mauritius screw-pine (*Pandanus vacoa*) and American maize.

Before closing this portion of the report, it may be observed that
Extension of Nursery. the additional piece of ground applied for in 1844, consisting of about twenty-five beegahs, has been granted by the Government of Bengal on the recommendation of the Superintendent of the H. C. Botanic garden.

While however the Society has paid due attention to subjects
Horticultural De- more particularly connected with Agriculture, partment.—Vegetable and the growth of superior varieties of sugar and fruit exhibitions. cane, fruit trees, &c., it has by no means been

unmindful of the claims of other though minor departments of its labors. Three shows of vegetables and fruits have been held during the year, namely, in January, May and October, with the view of continuing that steady encouragement to the native gardeners which the Society has fostered for so many years. The experiment which was commenced in 1844, of substituting quarterly for annual exhibitions, appears to work well, and there is every reason to hope that the same stimulus which has so materially contributed towards improving the quality of vegetables introduced from other parts of the world, will much assist in the principal object contemplated by this altered arrangement, namely, the bringing of these products earlier into the market, and retaining them longer in season, thereby affording a supply of peas, cauliflowers, turnips and other esculents for six or seven months of the year, instead of limiting them, as at present, to four or five. The total sum awarded during the year under this head for prizes, amounts to rupees 312, besides five silver medals.

The last report alluded to the circumstance of rupees 264 having been placed at the disposal of the Society by one of its Members (W. P. Grant, Esq.) for the express purpose of inducing the market gardeners, by the offer of handsome rewards, to pay more attention to the culture of celery, the improvement of which has not kept pace with other European vegetables. Although due notice was given of this intention, the result has not been so satisfactory as could be wished. At a meeting which was held in March, independently of the other shows,—that being the month when this vegetable is at its greatest comparative perfection,—the specimens exhibited were so inferior to what had been anticipated, that less than three-fourths of the sum set apart for prizes was awarded; the samples brought forward at the succeeding shows in May and October, were by no means so superior as to entitle the producers to any extraordinary mark of patronage.

The attempt made during 1844, to create a greater degree of interest for the culture of flowers by the establishment of periodical exhibitions, has been continued during the present year. Four shows have been held, namely in February, April, August, and December, and a total sum of Rs. 432, awarded from the handsome yearly do-

Horti-floricultural Department.—Flower shows.

nation,* placed at the disposal of the Society by one of its Vice-Presidents, Sir Lawrence Peel. Taking into account that these shows are yet in their infancy, the display of flowers, both indigenous and exotic, has been as varied as could perhaps be expected, while a spirit of competition has been evinced, which is likely to keep up a desire for the introduction of rarer varieties, and the improvement of the indigenous stock.

Under this head it may be mentioned that a supply of garden seeds has been imported during the year from the Cape, garden and flower seeds from America, and flower seeds from England. The seeds from the Cape have not proved equal to the assortment usually sent by Messrs. Villet, which circumstance has been duly notified to them. The supply from America has, it is believed, given satisfaction, but its arrival late in the season, has prevented many of the more distant members from participating in the distribution. The measures now taken by the Garden Committee will, in all probability, prevent a recurrence of this nature. The flower seeds from England, both the selection from Messrs. Veitch of Exeter, and Messrs. Carter of London, have again, unfortunately, failed to germinate. The order for the next season, it may be added, has been given to Messrs. Wrench and Son, and it is to be hoped, from the excellent condition in which the supply of Agricultural seeds sent by that firm has come to hand, that better success may attend their consignment.

An active correspondence and interchange of seeds have been carried on during the twelve months with the Branch and other Agricultural and Horticultural Societies. Branch Societies and kindred institutions at the other Presidencies, tending, it is hoped, to stimulate the efforts of all in the good work, while aiding in the introduction of new cultures and in the improvement of old ones in their respective districts.

The Branch Society at Bhaugleapore, continues to increase in strength and usefulness. Established only three years ago, this institution already numbers about 240 Members, and, commanding

* The Annual grant is 400 rupees, but a surplus from last year's donation has enabled the Committee to exceed that sum by thirty-two rupees.

as it does a fine central position, will, in all probability, add annually to its ranks. Several exhibitions with a view to the improvement of grains, vegetables, fruits and flowers, have been held during the year under its auspices, assisting to strengthen that desire for the amelioration of the agricultural resources of the district, which its earlier efforts have so materially aided in raising in the minds of the wealthy and influential zemindars of the district.

The Lucknow Society and Garden still continue under the zealous management of Captain G. E. Hollings, whose handsome donation of plants has been already referred to ; and the Cuttack Garden is also still indebted to the care of Captain W. Dunlop. To this garden, as likewise to the others, the Society has accorded all the assistance in its power, in the way of seeds, plants, &c.

The society alluded in its last report to the formation of two public Gardens at Benares and Budaon. It has now the pleasure to add that of Mirzapore to the list.

The substitution of a Journal in parts for the former monthly issue, which was commenced last year, has been
Literary Department. carried on steadily during the present ; the fourth,
Journal of the Society. or closing part of vol. III. and three parts of vol. IV. having been published during that period. While acknowledging its obligations to all its correspondents, the Society would more particularly draw attention to the interesting papers from A. Sconce, Esq.—“ A comparative account of the relative position of landlords, tenants, ryots, produce, labor and wages in India and England ;” to the Memoir of the late W. Griffith, Esq. from the pen of Dr. McClelland ; to certain “ Observations on the applicability of artificial manures to the cultivation of the Sugar cane,” &c., by T. F. Henley, Esq. ; to Capt. S. F. Hannay’s “ Observations on the quality of the principal timber trees growing in the vicinity of Jeypore, in Upper Assam ;” to a “ Method of ascertaining the amount of crystallizable Sugar in Khar or Muscavado,” by J. W. Laidley, Esq. ; and to a series of interesting communications regarding the valuable properties of the American Sumach, and the propriety of introducing the tree in India, communicated by Dr. Wallich ; all which have appeared in consecutive pages of the Journal.

The Society has the pleasure to mention, that the offer made in 1844, by H. C. Tucker, Esq., Collector of Gorruckpore, to award the sum of 300 rupees and a gold medal, to the author of a good Hand-Book of Agri-Horticulture, in the Vernacular, has been responded to by Mr. H. Fenwick, of Calcutta. The work prepared by this gentleman, having been favorably reported on by Mr. Tucker and by many of the respectable natives of Gorruckpore, the Society has transferred the *M.S.* to its Committee of Papers, to arrange for its publication. The entire proceeds of the first edition, consisting of 500 copies, will be transferred by the Society to the author.

In connection with the Literary Department of its labours, it may not be out of place to mention in this part of the report, that the Society has also voted the sum of three hundred rupees to Mr. L. Wray, in acknowledgment of his labor in the production of the work entitled the "Sugar Planter's Companion," which was published, in parts, in the second and third volumes of the Journal.

The public subscription which was commenced by the Metcalfe Hall Committee, in 1844, having failed to realize more than a fifth part of the balance due on account of the building, a special meeting of the Society was convened in the month of September, to take the subject into further consideration. A munificent offer on the part of Sir Lawrence Peel to bear one-fourth of the debt, provided this Society and the Public Library engaged to liquidate the remainder within a certain period, was submitted on that occasion, and the Society immediately agreed to be responsible for the payment of its proportion (Rs. 6,093) liquidating the amount by an additional quarterly subscription of two rupees from each Member for the space of a couple of years. At the following general meeting in November, it was announced that with the view of assisting to pay this proportion at once, four Members of the Society, namely, Rajah Sutteechurn Ghosaul, Baboo Ramgopaul Ghose, Dr. Hufnagle, and Rustomjee Cowasjee, Esq. had most handsomely consented to advance as a loan for two years, without interest, the sum of 3,000 rupees, the two former gentle-

men 1,000 rupees each, and the two latter 500 rupees each;* whereupon a notice of motion was given, and agreed to at the next meeting, to the effect that the Society should borrow the balance on deposit of Company's paper belonging to its vested fund.

The Society has the pleasure to intimate that this has been fully effected. The Library having also paid its proportion, the apartments intended for the Society are now available, and will be taken possession of at the beginning of next year.

The Society is happy to state that the bust of the late Dr. Carey, to meet the cost of which the sum of £ 120 was transmitted in 1843, to Professor Royle, has been received, and will shortly occupy the place appropriated for it in the lower hall of the Metcalfe Building. It may here be remarked, that the Society of Arts has awarded Nubboocomar Paul, a self-taught native sculptor of this city, its silver Isis Medal, for a clay bust of the venerable founder of the Society. The bust was prepared at the requisition of the Society, who forwarded it to the Society of Arts, for such recognition of the genius of the sculptor as it might deem him to deserve.

In conclusion, the Society would remark, that though the work
Conclusion. which has engaged its attention during the past
twelve months, as detailed in the foregoing brief summary, may not perhaps be considered of so important a character, when viewed abstractedly, as that embraced in some of the reports of previous years, yet it is hoped that the sum total of the endeavours which have been made to carry out those objects which come more immediately within its province, and the countenance afforded by the Executive to various other matters which have engaged its attention, will afford sufficient satisfaction to earn for the Society the continued support of all its old Members, and to hasten an influx of new and additional assistance.

•
* Since the above was written, Dr. Hufnagle and Rustomjee Cowasjee, Esq. have most generously presented their respective advances as a free gift to the Society.

Report of the Finance Committee.

The Finance Committee in offering their Annual Report, beg to submit the following statements of the receipts and disbursements, &c. of this Society for the year 1845, exhibiting the state of the funds of the Society, and showing *the receipts* for the past year to have been Rs. 25,926-6-1; including, however Rs. 5000 obtained as a loan for the purpose of liquidating the liabilities incurred for the completion of the Metcalfe Hall.

The total *disbursements* for the same period, amounting to Rs. 18,919-2-10, include an investment of Rs. 500 in a Government Promissory Note, and the expenditure of Rs. 500 for furniture; Rs. 600 as rewards for essays; Rs. 595 for flower bulbs; and Rs. 200 for a drawing of the Metcalfe Hall; aggregating 2,395 rupees, the four last items being extra expences, which are not likely to be again incurred.

The disbursements on account of the "Nursery Garden," Rs. 2,227, although apparently heavy, are relieved by a credit of Rs. 1,691, for Sugar canes sold during the year.

The cash balance amounts to Rs. 8,598-4-2, but of this Rs. 1,868-4-2, can only be considered as available for the ordinary purposes of the Society, as the remainder, Rs. 6,730, must be appropriated for the payment in full of the Society's debt on account of the Metcalfe Hall.

The Society's *vested fund* now amounts to Rs. 10,933-5-4 in Government securities; 7,283-5-4 being deposited in the hands of the Government Agent, and Rs. 3,700 as the collateral security for the loan of 3000. For the payment of this loan the Society has provided by levying the extra subscription of two rupees per quarter, and the Committee are most happy to state, that the Members generally have willingly acquiesced in this arrangement.

The amount of Bills payable and liabilities, is less than that of last year, and the amount of subscriptions collected during 1845, for the ordinary purposes of the Society, exceed that of 1844 by Rs. 1,400. Our list of arrears is also in an improved condition, and would no

doubt have exhibited a still more satisfactory result, but for the arrears upon the additional temporary subscription above referred to.

In conclusion, the Committee have great satisfaction in congratulating the Society on the state of its Finances.

CHARLES HUFFNAGLE,

M. S. STAUNTON,

*Members of the Finance Committee
of the Agri-Horticultural Society of India.*

Calcutta, Dec. 31st 1845.

Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India, from 1st January to the 31st December, 1845.

RECEIPTS.

From Members, subscriptions collected during the year for the ordinary purposes of the Society, ...	13,310 15 9
„ Ditto additional temporary subscriptions to assist in meeting the Society's proportion of the debt on the Metcalfe Hall, 366 0 0	
„ C. Huffnagle, Donation ditto ditto, 500 0 0	
„ Rustomjee Cowasjee, ditto ditto, 500 0 0	
„ Various other Members, ditto ditto, 364 0 0	
	<hr/> 1,730 0 0
„ Baboo Ramgopaul Ghose, Loan for 2 years without interest, ditto ditto, 1000 0 0	
„ Rajah Shutteechurn Ghosal, ditto ditto, 1000 0 0	
„ Bagshaw and Co, Loan with interest at 5 per cent. ditto ditto, 3000 0 0	
	<hr/> 5,000 0 0
„ Government annual donation, 1,045 0 0	
„ Do. Monthly allowance for 12 months at 135-13-6 per month, 1,630 2 0	
	<hr/> 2,675 2 0
„ Sir Lawrence Peel, donation to the Society for the year, to encourage the culture of flowers, &c. 400 0 0	
„ Accruings of interest on fixed assets, 427 1 4	
„ Proceeds of Sugar cane delivered from the Nursery Garden, in 1845, 1,691 11 0	
„ Do. of a portion of surplus Cape vegetable seeds sold in 1844 and 1845, 582 0 0	
„ Do. of copies of the Transactions of the Society, 55 12 9	
„ Do. by advertisement inserted in Journal, 33 5 8	
„ Do. of 15 old seed boxes sold, lined with tin, 11 8 0	
„ Do. of copies of the Journal of the Society, 7 0 0	
„ Do. of gumlahe, &c. furnished from the Nursery Garden, 1 14 0	
	<hr/> 2,383 0 0
Total Receipts Co.'s Rs.	25,926 6 1
„ Balance in the Bank of Bengal on 31st Dec. 1844, 946 9 9	
„ Ditto in the hands of Government Agent on ditto, 644 7 2	
	<hr/> 1,591 0 11
Grand Total Receipts Co.'s Rs. ...	27,517 7 0

DISBURSEMENTS.

FOREIGN VEGETABLE AND FLOWER SEEDS.

By C. N. Villet, for Cape garden seeds, 1,500 0 0	
„ Messrs. Landreth and Co. of Philadelphia, for American vegetable and flower seeds, 1,394 1 3	
	<hr/> 2,894 1 3

Statement.

ci

COTTON, MAIZE, WHEAT, ETC. SEED.

By Messrs. Landreth and Co. of Philadelphia, for American cotton and maize seeds, ...	...	...	...	224 7 0	
„ J. Mackey and Co. for a quantity of wheat seed ordered from Van Dieman's Land and Sydney, ...	...	...	...	309 3 0	
„ J. Cowell, for cost and transit charges of two cases (about 2 maunds) madder seed, ...	...	...	...	89 0 0	
					622 10 0

FRUIT TREES AND FLOWER BULBS.

„ Dr. Lamb, for 100 mangoe grafts from Malda, ...	...	...	70 8 0	
„ H. Groom, for a supply of flower bulbs, ...	...	...	595 15 3	
				666 7 3

LIBRARY.

„ Books purchased during the year for the Library,	166 9 6	
--	-----	-----	---------	--

PRINTING.

„ Sundry parties for printing receipts, &c.	80 8 0	
---	-----	-----	--------	--

JOURNAL.

„ Bishop's College Press, for printing Part 2, 3 and 4 of Volume 3, and Part 1, 2 and 3 of Vol. 4, ...	...	...	2,194 2 0	
„ Lithographing plates for Journal, ...	...	...	120 0 0	
„ Ostell and Lepage, for a ream of paper for plates for the Journal, ...	...	...	10 8 0	
				2,324 10 0

NURSERY GARDEN.

„ Ordinary expences incurred on account of the Nursery Garden, from 1st December 1844 to 30th November 1845, ...	...	...	2,046 2 6	
„ Additional expence (in part) for making a walk through the Garden, trenching about 15 beegahs of ground, &c. ...	...	...	81 0 0	
„ Ditto for burning bricks for flower garden walks, ...	...	...	100 0 0	
				2,227 2 6

ESTABLISHMENT.

“ Amount for Establishment, from 1st December 1844 to 30th November 1845,	4,320 0 0
---	-----	-----	-----	-----------

MEDALS.

„ Hamilton and Co. for gold and silver medals,	640 5 0	
--	-----	-----	---------	--

PECUNIARY REWARDS.

„ Prizes to Mallees for vegetables and fruits at the Exhibitions held on the 15th January, 13th May, and 24th October, ...	...	...	312 0 0	
„ Do. to do. for flowers at the Exhibitions held on the 14th February, 15th April, 25th August, and 30th December, ...	...	...	432 0 0	
„ Do. to do. for Celery at the Exhibition held on the 11th March, ...	...	...	61 0 0	
„ The Bhaugleapore Branch Society, Annual donation, ...	...	...	50 0 0	
„ The Cuttack, ditto ditto, ...	...	...	50 0 0	
„ The Hooghly, ditto ditto, ...	...	...	50 0 0	
„ Mr. L. Wray, the amount awarded at General Meeting of 9th April, for his work entitled “the Sugar Planter's Companion,”	...	...	300 0 0	
„ Mr. H. Fenwick, for his Hand Book of Agri-Horticulture in the Vernacular, being the amount placed at the disposal of the Society by H. C. Tucker, Esq. ...	...	...	300 0 0	
				1,555 0 0

Statement.

SOCIETY'S VESTED FUND.

By The Government Agent for the purchase of a four per cent. Government Promissory Note to be added to the Vested Fund, ...	500 0 0
---	---------

FURNITURE FOR METCALFE HALL.

„ Messrs. Currie and Co. second payment on account of furniture, ...	500 0 0
--	---------

METCALFE HALL.

„ W. Clarihew, for a drawing of the Metcalfe Hall, ...	200 0 0
--	---------

ADVERTISEMENTS.

„ Advertising in the public prints, notices of meetings, distribution of seeds, sugar cane, &c. &c. &c. ...	397 9 0
---	---------

STATIONARY.

„ Stationary for office books, and for the use of the office, ...	74 3 0
„ Ditto 14 reams of brown packing paper for packing seeds, ...	135 0 0
	<hr/> 209 3 0

FREIGHT.

„ Freight on boxes of seeds, plants, fruit trees, &c. from America, Cape, Bombay, Bhaugleapore, Lucknow, &c. ...	378 4 10
--	----------

POSTAGE AND SUNDRY OTHER CHARGES.

„ Postage on the Journal, on letters sent and received, and for petty expences, ...	710 0 0
„ Messrs. Grindlay and Co. for expences incurred by them in the despatch of fruit trees, flower, &c. seeds, receipt, and distribution of the Society's Journal, postage, &c. ...	222 11 6
„ Eggs of silk worms, &c, procured on account of Government, ...	17 0 0
„ Making three analyses of soils from the Tenasserim Coast, ...	48 0 0
„ Engrossing wheat and sugar petitions, ...	68 0 0
„ Amount advanced by Villet and Son, for insuring Cape garden seeds, ...	57 0 0
„ Extra Packermen for subdividing seeds, ...	23 1 0
„ Extra Writers, for writing on papers of ditto, ...	7 0 0
„ Present to Constables and Burkundauses for attending at Horticultural and Floricultural Exhibitions during the year, ...	84 0 0
	<hr/> 1,236 12 6

Total Disbursements Co.'s Rs. ... 18,919 2 10

Balance in the Bank of Bengal on 31st December 1845, ...	8,026 11 8
Ditto in the hands of Government Agent, on ditto, ...	571 8 6
	<hr/> 8,598 4 2

Grand Total Co.'s Rs. ... 27,517 7 0

MEMORANDUM.

DISBURSEMENTS.	
To Amount of Disbursements during the year 1845, as per Statement, ...	18,919 2 10
.. Balance in the Bank of Bengal on the 31st December 1845, ...	8,026 11 8
.. Ditto in the hands of the Government Agent on ditto, ...	571 8 6
Total Co.'s Rs. ...	8,598 4 2
	<hr/>
	27,517 7 0

BILLS PAYABLE AND LIABILITIES.

Amount due by the Society for expenses incurred for English flower seeds in 1845, ...	556 6 0
Amount of Loan taken from the Universal Life Assurance Society with interest at 5 per cent, ...	2,000 0 0
Ditto from Rajah Shuteeschnurn Ghoseal without interest for 3 years, ...	1,000 0 0
Ditto from Baboo Ramgopal Ghose ditto, ...	1,000 0 0
	<hr/>
Amount for prizes for improvement in Indian Churka, ...	5,000 0 0
	<hr/>
	830 0 0
Total Co.'s Rs. ...	6,176 6 0

Liabilities.

RECEIPTS.	
By amount of Receipts during the year 1845, as per statement ...	25,926 6 1
.. Balance in the Bank of Bengal on the 31st December 1844, ...	946 9 9
.. Ditto in the hands of the Government Agent, ...	644 7 2
	<hr/>
Total, Co.'s Rs. ...	1,591 0 11
	<hr/>
	27,517 7 0
	<hr/>
DEPENDENCIES.	
Amount invested in Government Securities, lodged in the Government Agency office, ...	7,233 5 4
Ditto lodged with the Secretaries of the Universal Life Assurance Society, in satisfaction of Loan of Rs. 3,000 as per contra, ...	3,700 0 0
	<hr/>
	10,933 5 4
	<hr/>
	8,679 0 3
	<hr/>
Amount of subscription in arrear, ...	
Total Co.'s Rs. ...	19,612 5 7

Statement.

ciji

The Observations during the present Month, have been made for the most part with a supply of new and first instruments received into the Observatory, by orders of the Bengal Government, a brief description of the Instrum-

Moon's Phase.	Observed at 9 a. 50 m.					Observed at Apparent Noon.					Observed at 4 p. m.					Observations made at Sunset.					Rain. Gauges.	
	Temperature.					Temperature.					Temperature.					Temperature.					Elevation.	
	Barometer reduced to 32° Fahr.	Of the Mer.	Of the Air.	Of wet Bulb.	Wind. Direction from Sunrise to 9 h. 50 m.	Barometer reduced to 32° Fahr.	Of the Mer.	Of the Air.	Of wet Bulb.	Wind. Direction from 9 h. 50 m. to Noon.	Barometer reduced to 32° Fahr.	Of the Mer.	Of the Air.	Of wet Bulb.	Wind. Direction from 4 p. m. to Sunset.	Barometer reduced to 32° Fahr.	Of the Mer.	Of the Air.	Of wet Bulb.	Wind. Direction from 4 p. m. to Sunset.	Upper. Feet. 56	Lower. Feet. 7
15	29.728	85.5	85.8	80.0	N. W.	29.702	88.9	88.0	81.0	W.	29.626	91.0	90.8	80.0	N. W.	29.636	88.0	88.0	80.0	N. W.	..	..
16	776	88.0	89.0	81.5	W.	748	91.0	91.0	81.0	W.	748	91.0	91.0	81.0	W.	678	88.0	88.0	79.8	W.	..	..
17	764	90.0	91.0	82.8	W.	745	92.0	92.0	82.2	W.	643	92.0	92.0	81.7	W.	662	89.0	89.0	81.5	W.	1.19	1.84
18	744	87.0	88.0	80.8	N. W.	715	90.0	90.8	80.5	N. W.	619	92.0	92.0	79.8	N. E.	639	81.0	79.8	76.0	N. E.	0.92	0.28
19	740	89.5	90.0	81.5	E.	718	89.0	83.5	77.5	E. N. E.	636	83.0	83.9	77.4	E. N. E.	632	83.0	82.5	78.2	E. N. E.	0.23	0.28
20	727	89.0	89.0	82.0	E.	706	91.0	91.1	82.8	E. N. E.	633	83.0	92.0	81.6	E.	635	84.0	85.0	79.0	S.	..	..
21	747	89.0	89.0	82.0	S. W.	721	91.0	92.0	82.1	S.	666	86.5	87.0	81.0	S.	674	84.0	84.0	80.8	S.	0.18	0.28
22	819	86.0	86.0	80.9	S.	786	95.0	84.3	79.5	S. E.	738	84.5	85.0	79.0	S. E.	733	81.0	81.1	78.0	S. E.	0.12	0.16
23	784	87.0	87.0	81.8	S.	793	88.0	88.8	80.2	S. S. W.	704	83.0	84.0	79.8	S. S. W.	711	84.0	84.9	81.0	S.	..	..
24	781	86.4	87.5	81.0	S. W.	746	88.0	87.9	82.0	S. W.	685	85.5	86.0	81.0	S.	711	84.0	84.9	81.0	S.	..	..
25	747	86.0	86.0	81.0	S. W.	760	89.0	89.0	82.0	S.	668	88.0	88.0	82.2	S. S. W.	699	85.0	85.4	80.9	S. S. W.	0.31	0.41
26	771	83.5	84.5	80.8	N. W.	717	88.5	89.0	81.5	S. W.	665	80.0	79.0	77.0	S.	659	78.0	79.8	77.0	S.	0.23	0.47
27	789	85.0	85.0	78.0	N. W.	726	86.0	86.0	79.8	W.	700	76.0	76.0	74.8	N. W.	721	76.0	77.0	75.6	W.	..	..
28	830	83.0	84.0	78.0	N. W.	760	84.0	84.0	78.8	S.	689	87.0	86.0	78.0	S.	710	83.0	83.0	77.0	S.	..	..
29	837	87.0	88.0	80.3	N. W.	801	85.5	86.0	78.9	N. W.	714	88.0	87.8	78.4	N. W.	726	83.8	86.0	78.0	N. W.	..	..
30	804	87.2	89.0	81.0	E.	803	85.0	91.0	81.4	N. W.	690	91.0	91.0	79.8	N. W.	721	80.0	83.4	80.4	N. W.	..	..
31	791	86.0	87.7	80.0	N. W.	770	90.0	90.9	80.0	N. W.	700	83.0	83.7	77.8	N. E.	712	80.0	80.2	79.0	N. E.	0.02	0.05
32	741	86.0	87.5	79.4	N. W.	765	88.0	89.0	80.0	N. W.	674	87.5	87.8	78.8	N. W.	682	85.0	86.0	80.0	N. W.	..	..
33	779	87.0	87.3	80.9	S. W.	706	89.0	90.0	81.4	N. W.	624	89.5	89.4	79.4	N. W.	629	86.0	86.5	79.5	N. W.	..	..
34	875	81.0	79.5	77.0	S.	742	90.0	89.0	80.0	S.	672	90.0	89.5	79.5	S. W.	701	86.0	86.0	81.0	S. W.	..	..
35	873	86.5	87.5	81.5	S. W.	849	81.0	83.0	78.0	N. W.	779	85.0	83.0	78.0	N. W.	794	81.0	82.0	79.0	N. W.	..	..
36	766	88.0	89.0	81.6	S. W.	737	90.5	91.5	79.5	S. W.	728	91.5	91.0	79.5	S. W.	729	87.0	86.8	79.6	S. W.	..	..
37	732	90.0	90.6	79.8	N. W.	734	92.5	94.0	80.5	W.	632	91.5	91.0	81.4	S. W.	659	87.0	88.0	82.0	S. W.	..	..
38	706	88.0	89.0	81.9	N. W.	733	93.0	93.4	81.0	N. W.	634	93.5	92.4	77.8	N. W.	650	89.8	89.9	81.0	N. W.	..	..
39	710	89.0	90.0	78.5	S. W.	674	91.0	91.0	81.0	N. W.	603	90.5	90.0	80.2	N. W.	630	89.7	89.8	81.5	N. W.	..	..
40	831	90.0	90.5	81.5	S. E.	667	92.0	92.5	78.5	S. W.	672	92.4	92.0	78.0	S. W.	612	87.0	87.0	81.0	N. W.	..	..
41	840	90.0	90.1	81.0	W.	740	91.2	92.0	80.0	N. E.	673	94.0	90.8	79.2	S. E.	603	89.5	89.4	79.2	S. E.	..	..
42						793	92.8	93.0	81.0	S. E.	719	94.0	93.5	79.0	S. S. E.	728	89.8	89.0	79.5	S. E.	..	..
43						806	92.6	93.0	80.2	S. E.	727	94.0	93.0	76.5	S.	743	89.0	89.0	77.4	S.	..	..

Observed at 9 a. 50 m.										Noon.										Observed at 4 p. m.									
Temperature.					Wind.	Temperature.					Wind.	Temperature.					Wind.	Temperature.					Wind.						
Of the Mer- cury.					Direction	Of the Mer- cury.					Direction	Of the Mer- cury.					Direction	Of the Mer- cury.					Direction						
Of wet Bulb.					from 9 h. 50 m.	Of wet Bulb.					from 9 h. 50 m.	Of wet Bulb.					from 4 p. m.	Of wet Bulb.					from 4 p. m.						
Inches						Inches						Inches						Inches											
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. E.	29.975	86.0	86.0	71.0	N. E.	29.986	88.0	86.0	71.0	N. E.	29.919	84.0	82.0	72.2	N. E.	29.930	83.0	82.0	71.7	N. E.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. E.	29.983	85.8	85.8	73.0	N. E.	29.993	87.0	86.0	71.0	N. E.	29.940	83.0	82.0	70.6	N. E.	29.950	83.0	82.0	70.6	N. E.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. E.	30.006	84.5	83.8	71.0	N. E.	30.006	84.5	83.8	71.0	N. E.	30.006	84.5	83.8	71.0	N. E.	30.006	84.5	83.8	71.0	N. E.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	29.973	83.9	83.8	71.2	N. W.	29.973	83.9	83.8	71.2	N. W.	29.973	83.9	83.8	71.2	N. W.	29.973	83.9	83.8	71.2	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	991	83.9	83.8	71.2	N. W.	991	83.9	83.8	71.2	N. W.	991	83.9	83.8	71.2	N. W.	991	83.9	83.8	71.2	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.	960	83.0	83.9	70.0	N. W.					
Barometer reduced to 32° Fahr.	82.5	83.4	74.0	N. W.	960	83.0	83.9	70.0																					

Monthly Proceedings of the Society.

(Friday, the 11th of July 1845.)

Rajah Radakant Deb Bahadoor, Vice President, in the chair.

The minutes of the last meeting were read and confirmed.

Members Elected.

Lieut. H. A. Olpherts, of the artillery, who was proposed at the last meeting, was duly elected a member of the Society.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :

Major William Sage, (48th N. I.) Superintending Engineer, S. E. Provinces, proposed by C. K. Robison, Esq., seconded by the Secretary.

George Taylor, Esq., Barrister at law, proposed by the Secretary, seconded by Rajah Radakant Deb.

Presentations to the Library.

Journal of the Asiatic Society of Bengal, Nos. 72 and 73. *Presented by the Society.*

The India Journal of Medical and Physical Science, Part VII. of Vol. III. *Presented by Dr. Finch.*

Garden and Museum.

1. Specimens of winter Barley (*Hordeum tetrastichum*), and of two-rowed Barley (*H. distichum*). *Presented by Dr. Wallich.*

Dr. Wallich states, that these specimens have been sent down by Major Lawrence, who has reared them in Nepaul, from a small supply which he (Dr. Wallich) received from Dr. Royle at the India House in November last.

2. A supply of beet, cauliflower, artichoke, and mignonette seed, the produce of the Branch Society's garden at Baugleporc. *Presented by Major Napleton.*

3. Six Mazagon Mango seedlings. *Presented by C. K. Robison, Esq.*

4. Six specimens of Wood from Kurmiong in the Darjeeling territory, from Dr. Campbell, Supt. of Darjeeling. *Presented by C. Beadon, Esq.*

5. Two specimens of Wood from the jungles South of Poorulea. *Presented by Capt. S. R. Tickell, Assistant Commissioner of Chota Nagpore.*

6. A small supply of Nerbudda white Linseed, produced at Morghyr, fully equal in size to the original grain. *Presented by P. Palmer, Esq.*

Floricultural Exhibition.

A report from the Garden Committee, regarding the next exhibition of flowers, was the subject which first occupied the attention of the meeting. The Committee annex a schedule of prizes, amounting to 120 rupees, for the best specimens of exotic and indigenous produce. They recommend, that the show be held at noon on Monday the 25th of August, and suggest two additional conditions, to the effect that prize plants be precluded from being brought forward a second time for competition, and that each competitor certify to the specimens having been, at least, three months in his possession.

The Report and additional conditions were agreed to.

The Timber Trees of Darjeeling and Poorulia.

Two interesting communications from Capt. Tickell and Dr. Campbell, on the subject of the specimens of Woods above alluded to, were next read. Dr. Campbell observes, that there are an immense number of excellent woods in the Darjeeling territory, which it would be highly desirable to introduce into the Calcutta market; and the specimens he now forwards are sent in order to learn the probable market value per 100 cubic feet, with the view of ascertaining if they could be profitably forwarded to Calcutta in large quantities. Dr. Campbell adds, that these samples have been taken from Kursiong, as that place is within five miles of hackery carriage, and that there are many more kinds of wood in the same place.

The following is a copy of Capt. Tickell's letter :

MY DEAR SIR,—I beg to send you samples of two very beautiful kinds of Wood, which I have come accidentally across in the jungles south of this station. The specimen marked 1, is known to the jungle people (Sootals, Bhoomijes, &c.) who call it "Kendar" or "Kerria;" but I do not hear that they make any use of it. The appearance of the sample will speak for itself. To my taste—it is more beautiful than mahogany, having a rosy hue which that wood has not. The sample is cut from near the bark, so as to give a fair average idea of the wood. The heart is of course superior, and still richer in colour. It works easily and

smoothly, does not chip or crack by the weather, and the grain, as you will perceive, is so fine, that the smallest work with the highest finish could be done in it.

The specimen No. 2, is coarser and inferior; but still, I think, handsomer than "Toon." The tree is unknown and unnamed here. The one from which the sample was taken, was cut down by a carpenter of mine, out of mere curiosity. This wood also appears to stand the weather well. I showed a log of it to Colonel Onseley, G. G. Agent S. W. F., who appeared to think it was the "Rohunea," or mahogany of Upper India; but was uncertain.*

Of the trees, I cannot yet speak so as to describe them properly; but in the cold weather I shall endeavour to visit the jungle where they are found. (The trunks are large enough to give planks of two feet breadth). In the mean time I have sent people to bring in all the young plants they can find; also the seeds, (if on the tree); and I propose sending some of both down to you, if you consider them acceptable.

I cannot but think, that the production in places so near Calcutta of so beautiful a wood for the purpose of ornamental furniture, &c. is an object of some importance; and I would beg to suggest to the Society the advantages likely to be gained in forming large plantations of a tree which may perhaps, by better judges than myself, be thought mahogany.

The trees hitherto found are described to me as growing on the banks of water-courses at the foot of hills. The moist soil of Bengal might possibly be unfit for their growth; but the wood would be, I think, sufficiently valuable to cover the expense of land carriage from hence to Calcutta; or at all events from Bancoorah to Calcutta; supposing that the plantations could not be established at the latter place.

In conclusion, I shall be most happy to receive any instructions from judges in these matters—as to the points of information necessary to be furnished—previous to the Society coming to any resolution respecting the plantations, the establishment of which I earnestly hope will not be neglected.

I am, &c.,

S. R. TICKELL.

Poorulia, June 19, 1845.

At the close of the perusal of the above letters, the Secretary mentioned that he had requested Captain Tickell to favour the Society with seeds and young plants of these trees. He had, moreover, solicited

* Dr. Wallich has kindly offered to set this question at rest on receiving specimens of the leaves, &c.—&c.

Captain Tickell to send him, if possible, a sufficient quantity of the specimens marked No. 1, (which was very generally admired,) to be worked up into a small table.

After some little discussion, it was agreed that all these specimens (with copies of communications) should be sent, in the first instance, to Capt. Goodwyn, with a request that he would oblige the Society by having them subjected to trial, and by making such other experiments on them as he may deem fit.

The Timber Trees of Upper Assam.

The Secretary next brought to the notice of the meeting a valuable paper from the pen of Capt. F. S. Hannay, containing a list of the principal timber trees growing in the vicinity of Jeypoor, in Upper Assam, with an account, based on his own experience, as to the quality of some of the kinds, the general opinion of the people as to the uses and properties of all, together with a few observations on the localities of different forests, and the practicability of obtaining the best kinds for exportation. Capt. Hannay observes, that most of the trees in the list will be found to correspond with those in Mr. Masters' catalogue of timber trees of Upper Assam, published in the third volume of the Society's Journal, and as he believes they comprise all of what may be called "Forest Timber Trees," growing on the plains and on the hills, it may be considered of importance, with reference to the future timber trade of Assam, that the different samples and list should find a place in the Society's rooms for the inspection of the timber merchant.

The Secretary mentioned that, at the request of Capt. Hannay, the above paper had been forwarded to him by Major Jenkins, who had moreover added a few notes thereto in reference to such of the varieties as had come more immediately under his notice. The specimens had been despatched from Gowhatti, but had not yet reached their destination.

Botanical Observations in Upper Assam.

The Secretary intimated the receipt of another interesting paper on the plants found in the district round Sibsagur and Nazera, in Upper Assam, which had also been forwarded by Major Jenkins, at the request of the author, Mr. J. W. Masters. Mr. Masters mentions, that the observations noted in this paper are confined entirely to that part of the valley of Upper Assam, lying between N. Lat. 26° 35', and 27° 35', and E. Long. 94° 30', and 95° 30', bounded on the E. and S. by the Naga Hills; on the W. and N. by the Brahmapootra river; and that nearly all the

plants enumerated have been collected between the Dessi and Booree Dihing rivers, on elevations not exceeding 650 feet above the level of the sea.

It was directed, that the best thanks of the Society be given to Capt. Hannay and Mr. Masters for their respective communications, which were transferred to the Committee of Papers.

Horticultural Exhibition at Lucknow.

A letter from Capt. Hollings, Secy. of the Branch Society at Lucknow, was next read. Captain Hollings encloses a list of prizes, amounting to 68 Rs., which were given to the different Mallees belonging to the gardens in the cantonment and city of Lucknow, at a show held on the 9th June last. The exhibition of vegetables and fruits comprised many varieties; there was also a small assortment of flowers and field produce. The Mango to which the largest prize was awarded weighed 44 rupees. Captain Hollings adds, "The show far exceeded our anticipations, and there cannot be a doubt that a periodical repetition will ensure the attainment of the object we have in view."

The Wheat of British India.

The following letter from the Secretary E. I. and China Association, was next submitted.

*London East India and China Association,
Cowper's Court, Cornhill, 30th April, 1845*

SIR,—The present is to acquaint you, that Mr. Hutt has several notices before Parliament on the subject of Australian Wheat and Flour, and Wheat of British India, and that this Association has caused a petition to be presented to the House of Commons, numerously signed, in aid of your Society's petition presented the 4th June 1844, praying, that Wheats of British India may be admitted at the same rate of duty as Wheat and Flour the produce of Canada.

Yours, &c.

JOHN STIKEMAN,
Secy. E. I. and China Association.

Introduction of the Coffee Plant into the Deyrah Dhoon.

An interesting note from Mr. Vansittart, the Supt. of the Deyrah Dhoon, was next read. After alluding to the receipt of a quantity of

French madder seed from the Society, which seed he had long been trying to obtain, but unsuccessfully, and asking for a larger supply, with the view of giving it a trial at various elevations, Mr. Vansittart remarks :

“ I have after numerous failures been very successful in growing coffee from seed obtained from the Neilgherry hills and the Mysore district. The plant grows well in these hills, and has much resemblance to the Bengal plant. The difficulty has been the obtaining seed fresh enough. I have no doubt that the cultivation of coffee will become a staple of the Dhoon. It is difficult to *overcome the apathy of natives*, but I have advantages in the energetic exertions made by the European grantees of the Dhoon grants.

“ I wish that you could obtain some fresh coffee seed for me when the ripening season comes round. I am also sure, that cardamom and black pepper could be grown ; but I have not been successful in obtaining any seed. I should be much obliged if you could assist me.”

The Secretary mentioned that, through the kindness of Mr. W. Storm, he had been enabled to send a small quantity of pepper seed to Mr. Vansittart ; and that Colonel Ouseley had obligingly offered to forward a good supply of coffee seed direct from his fine plantation at Burkaghur.

Formation of a Public Garden at Mirzapore.

Mr. Ommaney, the Collector of Customs at Mirzapore, communicates in a letter dated the 2nd July, the pleasing intelligence of the proposed formation of a Public Garden at that station, and requests the assistance of the Society in furnishing seeds and plants. Mr. Ommaney mentions, that the Magistrate and Collector has provided a fine eligible piece of ground for the purpose, and the residents have subscribed towards the project.

The Secretary was requested to meet this requisition as far as the means of the Society would admit.

Beneficial Effects of Under-draining.

In his letter forwarding the communications of Capt. Hannay and Mr. Masters, Major Jenkins alludes to the beneficial effects which have resulted from the system of under-draining on wet soil, the particulars of which were submitted by him last year, and published in the third volume of the Society's Journal. He states : “ I gave you a short time back some account of my having rendered a bog tolerably good garden ground by under-draining it. I can now add, that it still continues to be very

satisfactory garden ground. In the cold weather I had a fair crop of wheat and barley off a part of it, (the season was very dry and unfavorable) : also good sugar-cane, and since, a very fine crop of maize; and about one-half I have now planted out with orange trees, for a permanent orange orchard, and all the trees are very thriving."

Communications on various subjects.

The following letters were also submitted :

1. From Dr. Robert Wight, enclosing a letter to his address from Mr. Fischer of Salem, which gives some useful information about the Nerium Indigo.

2. From P. P. Carter, Esq., of Bojespore factory, near Buxar, giving an account of the successful cultivation of the China sugar-cane.

The Secretary mentioned that, on receipt of the above letter, he had addressed Mr. S. H. Robinson of Dhoba, who had kindly given him such information as had enabled him to answer Mr. Carter's queries in a satisfactory manner.

The above two letters, and that of Mr. Robinson, were referred to the Committee of Papers.

3. From Capt. W. W. Dunlop, Secy. Branch Society at Cuttack, acknowledging the receipt of the French madder seed, and promising to give it every attention : stating also that the American Sumach has come up very well, and will be transplanted after the first rains. Capt. Dunlop adds :

" This year a considerable number of musk-melons have been raised in the Society's Garden from seed received from various quarters ; the fruit readily formed and ripened, but the flavor of none was equal to what is grown in the bed of the Moosee river at Hyderabad. The fruit to which I allude is of a greenish colour, and of true melon shape, with rather rough skin. I have written for some of this seed to sow next year, and if I am fortunate enough to procure it, I will send you some."

4. From G. C. Cheap, Esq., dated Bauleah, 4th July, suggesting the importation of Egyptian onion and melon seed.

The Secretary was requested to carry Mr. Cheap's suggestion into effect.

5. From Col. J. R. Ouseley, intimating his readiness to comply with the Society's request for a further supply of wheat, white linseed, &c. from the Nerbudda valley. Col. Ouseley mentions, that the wheat has

been partially blighted, and will not look so well; but that for seed it will do as well as the most beautiful grain.

6. From Messrs. Smith, Hufnagle and Balfour, giving extract of a letter from Messrs. Bevan and Humphreys of Philadelphia, in acknowledgment of an order for 500 maunds of Carolina seed paddy, which was given to the first named firm, by the government of Bengal, in January last, with the view of carrying into effect the recommendation of the Commissioner of Arracan for the general introduction of this superior description of grain into that province.

Messrs. Bevan and Humphreys express their intention of shipping the paddy in November next, which will afford time for its arrival in Calcutta at the next sowing season, March and April.

7. From C. Beadon, Esq., Under Secy. to the Government of Bengal, intimating the remission of duty on the bust of Dr. Carey.

For all the above communications and presentations, the best thanks of the Society were accorded.

(Wednesday, the 13th of August 1845.)

The Hon'ble Sir Lawrence Peel, Vice-President, in the chair.

The minutes of the last General Meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last meeting were duly elected members of the Society, viz :

Major Wm. Sage, Superintending Engineer of the S. E. Provinces, and George Taylor, Esq., Barrister at law.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :

H. B. Beresford, Esq., Civil Service, Balasore, proposed by Dr. Strong, seconded by the Secretary.

Wm. Stalkart, Esq., Goosree, proposed by Mr. R. Dodd, seconded by Mr. C. K. Robison.

George Dearman, Esq., (firm of Livingstone, Syers and Co.) proposed by Mr. Dodd, seconded by Mr. John Jenkins.

Owen Potter, Esq., (firm of Potter and Co.) proposed by Mr. Dodd, seconded by Mr. Robison.

John Hamilton, Esq., (firm of Mackenzie, Lyall and Co.) proposed by Mr. Robison, seconded by Mr. Dodd.

H. W. Abbott, Esq., Deputy Secretary, Union Bank, proposed by Mr. W. G. Rose, seconded by Mr. John Storm.

Presentations to the Library.

1. Proceedings of the Ceylon Agricultural Society to the 31st of December 1844. *Presented by the Society.*

2. Transactions of the Society of Arts, vol. LV. *Presented by the Society.*

3. Journal of the Asiatic Society of Bengal, No. 74. *Presented by the Society.*

4. The India Journal of Medical and Physical Science, No. VIII. of vol. III. *Presented by Dr. Finch.*

Garden and Museum.

1. A small supply of fruit trees, consisting of mango, pumplenose, and bread-fruit grafts. *Presented by the Madras Agri-Horticultural Society.*

2. A few seedling mango plants from the Royal Botanic Garden at Mauritius. *Presented by C. K. Robison, Esq.*

3. A fine supply of rare varieties of plants and cuttings for the flower garden. *Presented by Sir L. Peel.*

4. A varied assortment of vegetable, flower, and fruit seeds; also samples of Nerbudda and English wheats, all the produce of the public garden at Lucknow. *Presented by Capt. G. E. Hollings, on behalf of the Lucknow Branch Society.*

5. A further small supply of two kinds of English Barley acclimated at Nepaul. *Presented by Dr. Wallich.*

6. A few seeds of the Bermuda Cedar, forwarded by H. E. Lieut. Col. Reid, R. E., Governor of Bermuda. *Presented by H. Piddington, Esq.*

7. A few seeds of the Hydrabad Melon, described to be a superior variety. *Presented by Capt. W. W. Du. 'op, Secy. of the Cuttack Branch Society.*

8. A small supply of Nerbudda Julalya, and Sohalya Wheats, of white Gram and white Linseed, the produce of Chota Nagpore. *Presented by Lieut.-Colonel J. R. Ouseley.*

Colonel Ouseley mentions, that this seed was grown by a zemindar by name Heera Sing Chowdry, from seed supplied from his (Col. Ouseley's) garden; and he adds, "he has enough seed now to distribute among

others, and I think it will extend, as it is in great request, and quite a wonder to the other gentlemen farmers."*

9. A small quantity of seed of the Hill Bamboo, of wild Indigo, and wild Coffee. *Presented by W. Storm, Esq. on behalf of J. Pontet, Esq. of Bauglepore.*

Mr. Pontet states, that the wild Coffee was only discovered by him last year, and owing to the careless way in which it has been gathered, namely, after it had been a month on the ground, the color is not so good as it would otherwise be. Mr. Pontet thinks, that it will nevertheless be sufficient to prove that the soil in parts of the Bhauglepore district is well adapted for producing coffee; and he adds, that wherever he has discovered the plant, it has been invariably in rather shady places, and protected by hills from the westerly winds.

10. Samples of Agricultural seeds, wheat, barley, mungal-worzel, hemp, flax, rape, tares, &c. *Forwarded by Dr. Royle, from the India House, by the June Overland Mail.*

In his letter forwarding this packet, Dr. Royle intimates, that the above are samples of a large supply of agricultural seeds, which the Court of Directors have authorised him to send to the Society. The whole consignment has been furnished by Messrs. Wrench, one of the longest established and largest seedsmen of London; and shipped on board the *Wellesley*. These samples have been sent by the Overland conveyance, with the view of submitting them to experiment, and comparing the result with that from the same batch of seeds sent by sea. Dr. Royle adds, that some oats and carrot seeds have also been sent by the Overland conveyance to Colonel Gwatkin, to submit to experiment in the North West Provinces.

11. A few shawls of Mysore manufacture. *Forwarded for exhibition by Dr. Mouat.*

(Further notice of these shawls will be found in the body of the proceedings.)

12. A fine collection of specimens of Assam Timber trees. *Presented by Capt. S. F. Hannay.*

A few musters of Satins and Muslins, dyed with common flowers by a lady resident in Purneah, were also exhibited, and much admired for the beauty of their colours. The process of imparting the tints is described as being very simple, consisting merely in steeping the flowers

* Shortly after the meeting had broken up, a second communication was received from Col. Ouseley, intimating that in accordance with the request of the Society, he had despatched 133 seers of white linseed and 82 of Julalya wheat, which had just arrived from the Nerbudda.—*Exc.*

in boiling water for half an hour or so, and keeping the stuffs in it for a certain time, according to the depth of tint required; they are then hung up to dry in the shade, without being subjected to pressure. The flowers employed on this occasion were those of the *Hibiscus rosa sinensis*, and *Mussaenda frondosa*.

Sugar-cane, Fruit trees, Flower plants, and other Cultures at the Nursery Garden.

A report was brought up from the Garden Committee of a late visit to the Nursery. The Committee state, that the whole of the cane plantation is progressing favorably, and that the total quantity of cane for distribution during the season 1845-46, will average 43,000. They recommend, that the distribution commence from the 1st of October, and that a charge of six rupees per hundred be made inclusive of straw bands and the expense of packing, or 5-8 per hundred without packing. The Committee report favorably of the newly-formed flower garden, which has been mainly stocked with a fine supply of plants and cuttings presented by Sir L. Peel. They recommend pukka walks to be made throughout this plot of ground, at an extra expense not exceeding 115 rupees. The Committee allude to the receipt of a few fruit-tree grafts and seedlings from the Madras Agricultural Society, and from Mr. C. K. Robison, for the fruit-tree nursery, and state that all the other trees in this section of the garden are in good condition. They further intimate, that two beegahs of ground have been apportioned, and are in course of preparation for a kitchen garden; and close their report by an allusion to the state of the arrow-root, tapioca, ginger, Guinea grass, and other useful cultures.

The Report of the Committee was confirmed.

Application of Wind-mill power in India.

A communication from Dr. Buist, written at Alexandria, intimating his intention of preparing a paper for the Society's Journal on the application of Wind-mill power in India for raising water, and for other purposes, was next read. The following is extract of his letter, dated 7th of June:

"I write you from Alexandria on a matter of the Agricultural Society's business. Before leaving Bombay I had for some time been engaged in the construction of Wind-mills for the purpose of raising water, of such simple form as to be within the reach of native craftsmen. I made two for the Government garden at Kurrachee, and hope before leaving

England to hear of the result of their operation. When at Cairo I narrowly examined the numberless Wind-mills there employed in grinding wheat for the Pasha. I made some drawings, which I hope to have completed here. I wish to write you a long letter on the subject for publication in your Transactions, if you think it deserving of so much honor. Will you allow me to have wood-cut illustrations engraven for it in London? They would cost about £8, or Rs. 70. I shall have them stereotyped, so that the subject being of universal interest, the article might go the round of all the newspapers in India.

For Bombay, besides this I shall have a small working model made up at home, such as the stupidest native carpenter could copy: it will cost about £5. Would your Society like to have another of the same? When one sees the extent to which Wind-mills are employed in a country so barbarous as Egypt, it seems quite monstrous that we should have nothing but human labour called into use for the most ordinary purposes in India. Is there a single Wind-mill in the Company's dominions? The Egyptian Flour-mill is a very simple, workable, common-sense machine, cheap, and easy of construction, and scarcely capable of being mismanaged, and never by any chance out of order. Our sea-breeze at Bombay is three times as strong as the winds by which the mills at Cairo are driven.

"Will you kindly write me on these subjects. I shall most likely take the engraving into my own hands, and have the letter above referred to with illustrative wood engravings got up, and despatched on my own responsibility, before I can receive your reply. I shall trust to you for requital.

"It is as touching the model I wish you to write; this I shall not meddle with without your authority."

Resolved—That the thanks of the Society be given to Dr. Buist for his obliging offer, and that the expense for wood-cut illustrations and a model be incurred.

Rapid and satisfactory progress of Silk culture in the Mysore country.

The papers next submitted had reference to the shawls referred to under the head of presentations. Dr. Mouat states, that he sends these fabrics with the view of giving the Society an idea of the Mysore silk manufacture. The silk was obtained from worms reared in the neighbourhood of Bangalore, where, Dr. Mouat mentions, there is a splendid mulberry garden and stone worm-house containing an immense number of the insect in every stage, from the egg to its perfect and mature

condition. "Captain Haines, the superintendent of the garden," adds Dr. Mouat, "has promised to send me an account of it with specimens of the cocoon and raw silk when reeled. The manufactured condition is well exhibited in the specimens now submitted, of which the dyes, patterns, and every thing connected with them are the unaided labours of the Bangalore manufacturers, with the single exception perhaps of the reels, some of which were constructed by Captain Green of the Madras Engineers, and are very simple and efficient; the shuttles used are all native, and of the rudest and most primitive form. It was my intention when I visited the garden and manufactures carried on within the pettah or native town of Bangalore, to have drawn up a short account of them for the Society; but as the Officer in charge of them, who is not only well acquainted with the subject but takes a great interest in it, has kindly promised to do so, the Society will be no loser by my silence. The silk manufactures of every part of India are so important and capable of being carried to so great a pitch of perfection, as to be worthy the attentive consideration of all who take an interest in developing and improving its resources."

Dr. Mouat concludes his letter with a few remarks regarding the vegetable products of Bangalore, and its natural advantages as regards climate and soil, which he thinks, might, with a little public spirit and enthusiasm in agricultural pursuits, be rendered much more productive, than at present, to the surrounding country.

In connection with the above letter, the Secretary drew the attention of the meeting to the first volume of the Society's Journal, page 196, wherein is published a correspondence which took place in 1841, between the Bangalore Society and this Institution, relative to the mode of manufacturing silk in Mysore at that period, with suggestions for its improvement. He stated, that it was in consequence of the specimens of raw silk forwarded on that occasion, being considered very coarse,—more like fine flax than silk,—that this Society was induced to furnish the Secretary of the Bangalore Society, through a correspondent, with a supply of eggs of the Bengal silk-worm. The result of this introduction, combined with the care and attention since paid to the culture,—judging from the manufactures now on the table,—was indeed very gratifying. To make the information on this subject more complete, he had the pleasure of submitting a report on these shawls in a communication with which he had been obligingly favoured by Mr. J. W. Laidlay, a member of the Society.*

* For this letter, see page 137 of Correspondence.—*Eds.*

The Metcalfe Hall.

A letter was read from Messrs. Burn and Co., intimating the receipt of Rs. 3,972 : 13 : 3 from the Metcalfe Hall Committee, and suggesting that a moiety of the balance still due to them on account of the Metcalfe Hall, be contributed by the Society, and the other half by the Public Library.

Communications on various subjects.

The following letters and papers were also submitted :—

1. From J. W. Laidlay, Esq., on a mode of ascertaining the amount of crystallizable sugar in *khar* or Muscavado.

2. From E. C. Ravenshaw, Esq., enclosing a letter to his address from Mr. Field, relative to the attempts lately made for the introduction of American cotton into the district of Shahabad.

3. From W. Haworth, Esq., submitting a report of experiments on indigo under various modes of treatment.

4. From Dr. Wallich, enclosing a communication to his address from Major Williams, in charge of the Kyouk Phyoo district, regarding a peculiar description of mango, some plants of which he intends sending to the Society.

5. From F. W. Russell, Esq., giving an account of his experiments with guano on vegetables.

The above communications were referred to the Committee of Papers.

6. From George Gardner, Esq., Supt. of the Royal Botanic Garden at Kandy, intimating his intention of meeting the wishes of the Society for certain descriptions of fruit trees from Ceylon.

7. From J. W. Yule, Esq., detailing the result of trials made by him at Ramnuggur, in the Champaran district, on a large assortment of seeds received from the Society.

8. From Major T. E. A. Napleton, Secy. of the Branch Society at Bhaugleapore, returning thanks for a quantity of guano and madder seed.

9. From T. G. Cleeve, Esq., Secretary of the Moorshedabad Branch Society, applying for a quantity of seeds and plants.

The Secretary mentioned that this request was about being complied with.

10. From Captain S. F. Hannay, Commandant of the Assam Light Infantry, dated Dibrughur, Upper Assam, intimating that there is an erroneous statement in the memoir of Dr. Griffith, by Dr. McClelland, at page 32, of the present volume of the Society's Journal, relative to the Batta-

lion under his command, which he wishes to correct. Capt. Hannay alludes to that part where it is mentioned that whole guards of the Assam Light Infantry were occasionally decapitated at night by the Nagas as they lay asleep; and states that such could not have been the case, as that regiment was never in collision with the Baza tribes of Upper Assam prior to 1841-42.

The Secretary informed the meeting, that he had sent the substance of Capt. Hannay's letter to Mr. McClelland; who had, in reply, furnished him with a brief memorandum on the subject. Mr. McClelland observes, that when Mr. Griffith and he returned from the Naga hills on the occasion alluded to, they were informed that they had been amongst the worst tribe, or one of the worst tribes of Nagas. Further, that Capt. Hannay was not in Assam at the time adverted to; and that the Assam Light Infantry was then commanded by Major White, who was afterwards decapitated during a night attack, on at least four companies of the Assam Infantry at Suddya, if not by the Nagas, at least by other tribes, equally expert at their peculiar mode of warfare.

8. From Messrs. Smith and Campbell of Sydney, advising the despatch of the consignment of N. S. Wales and Van Dieman's Land wheat ordered last year by the Society.

The Secretary intimated, that the supply had been unfortunately lost, having been shipped on the *Hydrabad*.

For the foregoing communications and presentations, the best thanks of the Society were accorded.

(Wednesday, the 10th September 1845.)

C. K. Robison, Esq., Vice-President, in the chair.

The minutes of the last General Meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last meeting were duly elected members of the Society, viz. :

Messrs. H. B. Beresford, Wm. Stalkart, George Dearman, Owen Potter, John Hamilton, and H. W. Abbott.

Candidate for Election.

H. Vansittart, Esq. C. S., Superintendent of Deyrah Dhoon, was proposed as a member by the Secretary, seconded by Mr. Robison.

Presentations to the Library.

1. The Calcutta Journal of Natural History, No. 22. *Presented by Dr. McClelland.*
2. Journal of the Asiatic Society of Bengal, Nos. 75 and 76. *Presented by the Society.*
3. The India Journal of Medical and Physical Science, No. 1X. of Vol. III. *Presented by Dr. Finch.*

Garden and Museum.

1. A fine supply, consisting of 133 seers of white Linseed, and 82 seers of Julalya Wheat from the Nerbudda valley. *Forwarded by Col. J. R. Ouseley.*

The Secretary informed the meeting, that owing to the precautionary measures adopted by Col. Ouseley, this supply had reached in excellent condition, and was now available for distribution to members.

2. Five seedlings from Arracan of the peculiar variety of Mango noticed in the last month's Proceedings. *Presented by Major D. Williams.*

3. One hundred Malda Mango grafts of six kinds. *Forwarded by Dr. John Lamb.*

The Secretary mentioned, that the whole of this supply had arrived in good order, and would be planted out shortly in the fruit-tree nursery.

4. Specimen of Madder root (*Rubia tinctorum*) raised at the Botanic Garden at Sooneri. *Presented by Dr. Alexander Gibson, Superintendent of the Botanic Gardens, Bombay Presidency.*

5. Specimens of Maize, the produce of his garden, from American seed. *Presented by Rajah Radhakant Deb, Bahadoor.*

Exhibition of Flowers.

A list of prizes, amounting to eighty three-rupees, which were awarded at the Floricultural Exhibition held on the 25th of August, was laid on the table. In the remarks appended to this list, it is stated that the collection of flowers brought forward, at this third quarterly show, was greater than was anticipated, considering the heavy falls of rain experienced at the end of July, and the greater part of August. The assortment of indigenous flowers was however much less varied than the present season of the year, so favorable for them, gave promise of. Among the exotics, verbenas of three kinds; roses, of three sorts; petunias, jatrophas, maurandias, malphigias, and cordia allamanda,

afforded about the best specimens; of the zinnias and passifloras there was a very poor collection, and of the *kennedya monophylla*, *virgilea aurea*,* and a few other kinds named in the list, there was not a single specimen. The prizes offered for these were accordingly transferred to some very pretty specimens of the *justicia carnea*, *solanum coriaceum*, *xylophylla angustifolia* and *elongata*, *hemerocallis japonica*, *lophospermum scandens*, and a few others as enumerated in the list.

The collection of indigenous plants and cut specimens, as before observed, was by no means equal to the foreign. There was, however, a large variety of ixoras, and some pretty kinds of balsams, thunbergias, &c. The cleredendrons and bignonias were a failure, and there were few or no specimens of the ipomœa, convolvuli and mimosa families, or of 5 or 6 others, for which prizes were held out.

The great preponderance of plants in pots over cut specimens was a good feature in this exhibition. With the exception of a couple of fine bouquets and a few vases of flowers, the whole of the room was occupied by healthy growing plants.

Horticultural Exhibition.

A report from the Fruit and Kitchen Garden Committee, regarding the next show of vegetables and fruits, was submitted. The Committee propose, that the show be held on Friday the 24th October, at 10 A. M., and give a schedule of prizes, amounting to 104 rupees, to be awarded on that occasion. The report was agreed to.

Defaulters to the Society.

An extract from the Proceedings of the last monthly Meeting of the Finance Committee was next read. The Committee state that, in virtue of the authority vested in them by the General Meeting of the 14th September 1842, they have addressed a few members of the Society, who are much in arrear with their subscriptions; that two of these gentlemen have taken no notice of their repeated communications, though both of them are more than three years in arrear, and they therefore suggest the publication of their names in the Proceedings of the Society, in terms of the following resolution :

“That the Finance Committee have the power to revise from time to time the list of subscriptions in arrear, and that they be empowered to publish periodically the names of those defaulters, the recovery of whose subscriptions is hopeless.”

The Committee add, that they have allowed a longer time to the other members, as they have acknowledged their liabilities, and expressed a willingness to meet them.

Resolved—That the names of the two members referred to by the Committee be placed on the Proceedings, and published as defaulters to the Society, viz. : -

Baboo Woomeschunder Roy of Santipore, and Mr. F. A. J. Elson of Chittagong.

The Metcalfe Hall.

Dr. Egerton, as a Curator of the Calcutta Public Library, laid before the Meeting a copy of the Proceedings of the Proprietors of that Institution, held at the Metcalfe Hall, on the 27th ultimo, and intimated that the subscription therein referred to, was progressing favorably. Whereupon, after a little discussion it was proposed by Mr. Robison, V. P., and unanimously *Resolved*—

“That with reference to the Proceedings of the Public Library Proprietors, furnished to this meeting by Dr. Egerton, a *Special Meeting* of the Agricultural Society be held at 4½ o'clock this day week, to consider all matters connected with the debt upon the Metcalfe Hall, and that the Secretary to the Metcalfe Hall Committee be requested to furnish this Society before that day, with all papers and accounts necessary for a due consideration of the subject.”

Communications on various subjects.

The following letters were also submitted :

1. From Capt. F. S. Gabb, Secy. to the Agricultural Society at Madras, enclosing extract from the Proceedings of a Committee of the Society on the subject of certain prizes awarded for the best specimens of silk, the produce of the Madras Presidency.
2. From Robert Smith, Esq. of the Military Board Office, giving the result of certain experiments made by him with guano on flowers.
3. From Capt. J. C. Brooke, submitting a recipe for the preparation of the *salep-misree* root.
4. From the Secretary, Society of Arts, forwarding an analysis of the Shan black vegetable dye; and intimating that the Society's silver medal had been awarded to Nubhoocomaz Paul for his clay bust of Dr. Carey.

5. From Dr. Gibson, Superintendent Botanic Gardens, Bombay, presenting a few roots of Madder raised by him, and requesting a report thereon.

The above communications were referred to the Committee of Papers.

6. From H. Vansittart, Esq., on the subject of the wild Coffee of Deyrah Dhoon, and the cultivation of Tea in that locality. In regard to the former, Mr. Vansittart observes :—" The wild coffee, to which I formerly alluded, is now ripening ; there are thousands of trees. It is my intention to pluck the fruit, prepare it, and distribute it among the zemindars ; thereby proving that the coffee culture will be advantageous, and introducing a luxury hitherto unknown to the poorer classes. I shall also forward you a specimen of this wild coffee."

Mr. Vansittart remarks, that Dr. Jameson is engaged in preparing tea from the plants of the Government plantation, and he adds, " It appears likely that the success of the experiment will exceed our most sanguine expectations, in which case both the grantees and I, through my zemindars, will exert ourselves to extend the cultivation of it."

7. From P. J. Sarkies, Esq., Secy. to the Society of Arrarat, requesting to be favored with a complete set of the Transactions and Journals of this Society.

Mr. Sarkies states : " Our object in requesting this favor is to translate the useful productions they contain into the Armenian language, and publish them in our Society's Weekly Journal, the " Patriot, " for the perusal of those of our countrymen who are unacquainted with the English language, both here and at other places. The first number of the said publication I beg leave to forward you herewith."

It was agreed, that this request be complied with.

8. From Capt. G. E. Hollings, Secretary Agri-Horticultural Society of Lucknow, requesting that an application be made to Dr. Buist for a model of his Wind-mill on account of their Society.

Capt. Hollings also encloses a list of vegetable and flower seeds, which he has just received from Messrs. Veitch of Exeter, and offers a portion of any of the varieties to the Society.

The Secretary mentioned, that Capt. Hollings' request in regard to the Wind-mill model had been complied with, and that he had availed himself, to a limited extent, of his kind offer of the vegetable and flower seeds.

9. From Major T. E. A. Napleton, Secretary Agri-Horticultural Society of Bauglepore, applying for the annual grant from the Parent Society of two silver medals and fifty rupees.

10. From H. C. Tucker, Esq., Magistrate and Collector of Gorruckpore, applying for a large assortment of seeds, plants, &c., for distribution in that district.

The Secretary stated, that both these applications had been complied with.

For all the foregoing presentations and communications the best thanks of the Society were accorded.

(Wednesday, the 17th of September 1845.)

(SPECIAL MEETING.)

Baboo Ramgopaul Ghose, *Vice President, in the Chair.*

The Chairman read the following resolution, passed at the last General Meeting, on which the present meeting was called, viz. :—

“ That a special meeting of the Society be held on the 17th Sept. at 4½ o'clock, to consider all matters connected with the debt upon the Metcalfe Hall, and that the Secretary to the Metcalfe Hall Committee be requested to furnish this Society before that day with all papers and accounts necessary for a due consideration of the subject.”

The Secretary submitted a memorandum of Receipts and Disbursements on account of the Metcalfe Hall, brought down to the present time. He also laid before the Meeting a detailed account of the extra expenses incurred by the Committee on account of the Building.

The Secretary next submitted a statement, shewing that the sum (Rupees 6,093) which this Society would have to pay on account of the Metcalfe Hall, on the proposition for settlement made by Sir Laurence Peel, might be liquidated in two years by an additional quarterly subscription of 2 rupees from each member; whereupon it was proposed by Major Wm. Sage, seconded by Mr. Wale Byrne, and

Resolved,—That this plan be adopted, and that for the period of two years, commencing from October next, the subscription to the Agricultural Society be Rs. 10 per quarter, instead of Rs. 8.

It was proposed by Mr. Bushby, seconded by the Chairman, and carried unanimously—“ That the special thanks of the Agricultural Society be presented to Sir Laurence Peel for his munificent donation towards payment of the debt on the Metcalfe Hall.”

Meteorological Register kept at the Surveyor General's Office Calcutta for the month of June, 1873.

Days of the Month.	Moon's Phases.	Observed at 9 a.m. 20 m.					Observations made at Apparent Noon					Observed at 4 p.m.					Observations made at Sunset.					Rain Gauges.	
		Temperature.					Temperature.					Temperature.					Temperature.					Elevation.	
		Barometer reduced to 32° Fahrenheit.	Of the Mercury.	Of the Air.	Of the Wet bulb.	Direction from 9 h. 50 m.	Barometer reduced to 32° Fahrenheit.	Of the Mercury.	Of the Air.	Of the Wet bulb.	Direction from 4 p.m.	Barometer reduced to 32° Fahrenheit.	Of the Mercury.	Of the Air.	Of the Wet bulb.	Direction from 4 p.m.	Barometer reduced to 32° Fahrenheit.	Of the Mercury.	Of the Air.	Of the Wet bulb.	Direction from 4 p.m.	Upper.	Lower.
		Inches.	°	°	°		Inches.	°	°	°		Inches.	°	°	°		Inches.	°	°	°		Feet.	Feet.
18.		29.48	76.1	92.0	83.5	S. E.	29.46	95.5	94.8	84.0	S.	29.47	97.4	96.0	84.8	S.	29.42	90.0	92.0	84.0	S. W.	56	7
19.		31.87	80.0	85.5	81.0	S. E.	31.44	84.0	83.5	72.2	S. E.	30.90	81.2	81.0	73.1	S. E.	30.40	79.0	81.0	74.5	S. E.	..	..
20.		33.31	87.0	89.0	87.5	S. W.	32.67	93.0	92.2	82.7	S. E.	32.00	94.2	93.8	84.9	S. E.	31.56	89.0	88.7	83.8	S. E.	..	..
21.		34.80	85.0	85.8	84.0	S. E.	34.61	88.0	87.5	81.0	S.	33.97	94.0	92.0	84.9	S. E.	33.40	90.0	90.0	81.5	S. E.	..	..
22.		36.38	89.5	93.5	83.5	S. E.	36.13	94.0	93.4	84.0	S. W.	35.24	97.0	95.5	83.0	S. W.	34.68	91.0	91.1	83.0	S. E.	..	..
23.		37.84	92.0	93.0	87.0	S. W.	37.55	96.5	97.0	87.0	S. E.	36.34	95.0	94.2	85.4	S. W.	35.40	90.0	90.0	84.0	S. W.	..	..
24.		39.36	87.0	87.5	83.2	W. S. W.	38.91	91.5	90.5	85.0	W.	37.91	94.0	95.0	85.0	W. N. W.	37.00	90.1	90.5	85.0	W. N. W.	..	..
25.		40.97	82.0	83.5	79.5	S. E.	40.79	87.0	88.4	84.4	S. E.	40.10	91.0	90.8	83.0	S. E.	39.56	90.1	90.5	85.0	W. N. W.	..	..
26.		42.56	88.0	87.8	79.5	S. W.	42.06	94.0	93.5	84.4	S. E.	41.38	89.5	84.1	80.0	S. E.	40.69	88.0	88.0	79.0	S. E.	..	..
27.		44.15	90.0	90.7	82.5	S. E.	43.44	92.5	93.3	84.5	S. E.	42.78	89.0	89.0	85.0	S. E.	42.12	88.0	88.0	79.0	S. E.	..	..
28.		45.74	88.0	87.9	82.0	S. W.	45.62	88.0	88.0	85.0	S. E.	44.91	90.5	90.8	83.5	S. W.	44.20	86.8	86.5	81.0	S. W.	..	..
29.		47.33	91.0	91.5	82.0	N. E.	46.80	93.0	93.0	81.5	N. E.	46.11	90.5	90.8	82.5	S. W.	45.40	88.8	88.5	81.0	S. W.	..	..
30.		48.92	91.0	90.5	82.0	S. W.	48.22	92.5	93.7	81.5	N. E.	47.53	89.0	89.0	82.5	N. E.	46.83	87.0	87.0	82.0	N. E.	..	..
31.		50.51	89.0	89.9	84.0	S. W.	50.00	91.5	93.1	84.0	S. W.	49.30	92.5	92.0	82.0	N. E.	48.60	88.0	88.0	79.5	N. E.	..	..
1.		52.10	89.0	89.9	82.0	W.	51.51	93.0	93.5	82.5	S. E.	50.82	92.5	92.0	82.0	S. W.	50.13	89.0	89.0	80.0	S. W.	..	..
2.		53.69	89.0	89.9	82.0	W.	53.02	93.0	93.5	82.5	S. E.	52.33	89.5	89.0	81.8	S. W.	51.64	87.0	87.0	81.4	S. W.	..	..
3.		55.28	89.0	89.9	82.0	W.	54.63	93.0	93.5	83.5	W.	53.94	92.0	92.0	82.0	S. W.	53.25	88.0	88.0	81.0	S. W.	..	..
4.		56.87	89.0	89.9	82.0	W.	56.14	93.0	93.5	83.5	W.	54.45	92.0	92.0	82.0	S. W.	53.76	88.0	88.0	81.0	S. W.	..	..
5.		58.46	89.0	89.9	82.0	W.	57.75	93.0	93.5	83.5	W.	55.96	92.0	92.0	82.0	S. W.	55.47	88.0	88.0	81.0	S. W.	..	..
6.		60.05	89.0	89.9	82.0	W.	59.34	93.0	93.5	83.5	W.	57.57	92.0	92.0	82.0	S. W.	57.08	88.0	88.0	81.0	S. W.	..	..
7.		61.64	89.0	89.9	82.0	W.	60.93	93.0	93.5	83.5	W.	59.17	92.0	92.0	82.0	S. W.	58.72	88.0	88.0	81.0	S. W.	..	..
8.		63.23	89.0	89.9	82.0	W.	62.52	93.0	93.5	83.5	W.	60.80	92.0	92.0	82.0	S. W.	60.41	88.0	88.0	81.0	S. W.	..	..
9.		64.82	89.0	89.9	82.0	W.	64.11	93.0	93.5	83.5	W.	62.44	92.0	92.0	82.0	S. W.	62.03	88.0	88.0	81.0	S. W.	..	..
10.		66.41	89.0	89.9	82.0	W.	65.70	93.0	93.5	83.5	W.	64.02	92.0	92.0	82.0	S. W.	63.64	88.0	88.0	81.0	S. W.	..	..
11.		68.00	89.0	89.9	82.0	W.	67.29	93.0	93.5	83.5	W.	65.61	92.0	92.0	82.0	S. W.	65.23	88.0	88.0	81.0	S. W.	..	..
12.		69.59	89.0	89.9	82.0	W.	68.88	93.0	93.5	83.5	W.	67.20	92.0	92.0	82.0	S. W.	66.82	88.0	88.0	81.0	S. W.	..	..
13.		71.18	89.0	89.9	82.0	W.	70.47	93.0	93.5	83.5	W.	68.79	92.0	92.0	82.0	S. W.	68.41	88.0	88.0	81.0	S. W.	..	..
14.		72.77	89.0	89.9	82.0	W.	72.06	93.0	93.5	83.5	W.	70.38	92.0	92.0	82.0	S. W.	70.00	88.0	88.0	81.0	S. W.	..	..
15.		74.36	89.0	89.9	82.0	W.	73.65	93.0	93.5	83.5	W.	71.97	92.0	92.0	82.0	S. W.	71.59	88.0	88.0	81.0	S. W.	..	..
16.		75.95	89.0	89.9	82.0	W.	75.24	93.0	93.5	83.5	W.	73.56	92.0	92.0	82.0	S. W.	73.18	88.0	88.0	81.0	S. W.	..	..
17.		77.54	89.0	89.9	82.0	W.	76.83	93.0	93.5	83.5	W.	75.15	92.0	92.0	82.0	S. W.	74.77	88.0	88.0	81.0	S. W.	..	..
18.		79.13	89.0	89.9	82.0	W.	78.42	93.0	93.5	83.5	W.	76.74	92.0	92.0	82.0	S. W.	76.36	88.0	88.0	81.0	S. W.	..	..
19.		80.72	89.0	89.9	82.0	W.	80.01	93.0	93.5	83.5	W.	78.33	92.0	92.0	82.0	S. W.	77.95	88.0	88.0	81.0	S. W.	..	..
20.		82.31	89.0	89.9	82.0	W.	81.60	93.0	93.5	83.5	W.	80.92	92.0	92.0	82.0	S. W.	79.54	88.0	88.0	81.0	S. W.	..	..
21.		83.90	89.0	89.9	82.0	W.	83.19	93.0	93.5	83.5	W.	82.51	92.0	92.0	82.0	S. W.	81.13	88.0	88.0	81.0	S. W.	..	..
22.		85.49	89.0	89.9	82.0	W.	84.78	93.0	93.5	83.5	W.	84.10	92.0	92.0	82.0	S. W.	82.72	88.0	88.0	81.0	S. W.	..	..
23.		87.08	89.0	89.9	82.0	W.	86.37	93.0	93.5	83.5	W.	85.69	92.0	92.0	82.0	S. W.	84.31	88.0	88.0	81.0	S. W.	..	..
24.		88.67	89.0	89.9	82.0	W.	87.96	93.0	93.5	83.5	W.	87.28	92.0	92.0	82.0	S. W.	85.90	88.0	88.0	81.0	S. W.	..	..
25.		90.26	89.0	89.9	82.0	W.	89.55	93.0	93.5	83.5	W.	88.87	92.0	92.0	82.0	S. W.	87.47	88.0	88.0	81.0	S. W.	..	..
26.		91.85	89.0	89.9	82.0	W.	91.14	93.0	93.5	83.5	W.	90.46	92.0	92.0	82.0	S. W.	89.06	88.0	88.0	81.0	S. W.	..	..
27.		93.44	89.0	89.9	82.0	W.	92.73	93.0	93.5	83.5	W.	92.05	92.0	92.0	82.0	S. W.	90.65	88.0	88.0	81.0	S. W.	..	..
28.		95.03	89.0	89.9	82.0	W.	94.32	93.0	93.5	83.5	W.	93.64	92.0	92.0	82.0	S. W.	92.24	88.0	88.0	81.0	S. W.	..	..
29.		96.62	89.0	89.9	82.0	W.	95.91	93.0	93.5	83.5	W.	95.23	92.0	92.0	82.0	S. W.	93.83	88.0	88.0	81.0	S. W.	..	..
30.		98.21	89.0	89.9	82.0	W.	97.50	93.0	93.5	83.5	W.	96.82	92.0	92.0	82.0	S. W.	95.42	88.0	88.0	81.0	S. W.	..	..
31.		99.80	89.0	89.9	82.0	W.	99.09	93.0	93.5	83.5	W.	98.41	92.0	92.0	82.0	S. W.	97.01	88.0	88.0	81.0	S. W.	..	..

Meteorological Register kept at the Surveyor General's Office, Valencia, for the Territory of California, 1850.

Days of the Month.	Observed at 9 h. 50 m.				Observed at Apparent Noon.				Observed at 4 P. M.				Observations made at Sunset.				Rain Gauges.					
	Barometer reduced to 32° Fahr.	Of the Mer.	Of the Air.	Of Wet bulb.	Wind.	Temperature.	Wind.	Temperature.	Barometer reduced to 32° Fahr.	Of the Mer.	Of the Air.	Of Wet bulb.	Wind.	Temperature.	Wind.	Barometer reduced to 32° Fahr.		Of the Mer.	Of the Air.	Of Wet bulb.	Wind.	Elevation.
August.	Feet.	Feet.	Feet.	Feet.	Direction from 9 h. 50 m.	Feet.	Feet.	Feet.	Feet.	Direction from 9 h. 50 m.	Feet.	Feet.	Feet.	Feet.	Direction from 9 h. 50 m.	Feet.	Feet.	Feet.	Feet.	Direction from 4 p. m.	Feet.	Feet.
1	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
2	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
3	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
4	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
5	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
6	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
7	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
8	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
9	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
10	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
11	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
12	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
13	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
14	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
15	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
16	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
17	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
18	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
19	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
20	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
21	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
22	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
23	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
24	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
25	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
26	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
27	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
28	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
29	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0
30	29.574	83.0	88.2	80.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0	S. W.	83.5	88.0

LIST OF MEMBERS
OF THE
Agricultural & Horticultural Society
OF
INDIA.

DECEMBER 31st, 1845.

Patron:

THE RIGHT HONORABLE SIR HENRY HARDINGE, G. C. B.
GOVERNOR GENERAL OF INDIA, ETC. ETC. ETC.

OFFICE BEARERS.

President:

SIR JOHN PETER GRANT.

Vice-Presidents:

SIR LAWRENCE PEEL.
C. K. ROBISON, ESQ.
RAJAH RADHAKAUNT DEB, BAHADOOR.
BABOO RAMGOPAUL GHOSE.

Honorary Secretary:

JAMES HUME, ESQ.

Deputy Secretary & Collector:

A. H. BLECHYNDEN, ESQ.

List of Members.

* This mark denotes Members, who have compounded for their Annual Subscriptions.

† This mark denotes Members, who are absent from India, and therefore Non-contributors.

†† This mark denotes Members, who though absent, are desirous of continuing their Subscriptions.

HONORARY MEMBERS.

The Right Honorable Sir Edward Ryan, A.M., F.A.S., London.
 Baron Von Ludwig, Cape of Good Hope.
 Charles Huffnagle, Esq. M.D., Calcutta.
 John Forbes Royle, Esq. M.D., F.R.S., F.L.S., F.G.S., Professor of
 Materia Medica, King's College, London.
 Colonel John Colvin, C.B., Bengal Engineers, London.
 Thomas Waghorn, Esq.
 J. Mackay, Esq.
 Don Ramas de la Sagra, Island of Cuba.
 Dr. Justus Liebig, Professor of Chemistry in the University of Gies-
 sen.

ORDINARY MEMBERS.

Abercrombie, Lieutenant William, Bengal Engineers, Agra.
 Abbott, H. W. Esq. Dep. Secy. Union Bank, Calcutta.
 Adam, George Ure, Esq. Merchant.
 Agabeg, Joseph, Esq. Merchant, Calcutta.
 Ainslie,† William, Esq. Merchant.
 Ainslie,† Daniel, Esq. Merchant.
 Alexander,† Nathaniel, Esq. Merchant.
 Alexander,† J. W. Esq. Assignee of Insolvent Estates, &c.
 Alexander,† William Stewart, Esq. Civil service, (Cape of Good
 Hope.)
 Allan, John, Esq. Merchant, Calcutta.
 Allan, Robert Townsend, Esq. Attorney, Supreme Court, Calcutta.
 Allen, C. Esq. Civil service, Agra.
 Alves,† Colonel N.
 Amman, Ernest M., Esq. Indigo planter.

- Andrew, John, Esq. Merchant, Calcutta.
 Anstruther,† The Honorable P., Esq.
 Ashqotos Dey, Baboo, Merchant, Calcutta.
 Atherton, H. Esq. Civil service, Jessore.
 Austin,† George, Esq. Indigo planter.
 Aylwin,† D. C. Esq. Merchant.
- Baillie,† Neil Benjamin Edmonstone, Esq. Attorney.
 Balfour,† G. G. Esq. Civil service, (Cape of Good Hope.)
 Balfour, Lewis, Esq. Merchant, Calcutta.
 Barlow, Robert, Esq. Civil service, Calcutta.
 Baron,* P. Esq. Indigo planter, Shajehanpore.
 Barton, George, Esq. Merchant, Calcutta.
 Beadon, Cecil, Esq. Civil service, Calcutta.
 Beaufort, Francis L. Esq. Civil service.
 Becher, John Edward, Esq. Indigo planter, Tirhoot.
 Bell,† R. C., Esq. Indigo planter.
 Bell, H. Hamilton, Esq. Landholder, Agra.
 Bennett, William, Esq. Soubutpore Factory, Commercolly.
 • Bentall,* Edward, Esq. Civil service, Jessore.
 Beresford, H. B. Esq. Civil service, Balasore.
 Bidwell,† Alfred Clarke, Esq. Civil service.
 Birch,* Captain Frederick William, (41st Regiment N. I.) Police
 Magistrate, Calcutta.
 Birch, Lieut.-Colonel R. J. H. Judge Advocate General.
 Birjonauth Dhur, Baboo, Merchant, Calcutta.
 Biscoe,† Thomas Porter, Esq. Civil service.
 Bishop, Captain G. W. Commanding Sappers and Miners at Dar-
 jeeling.
 Blake,† C. H. Esq.
 Bluntish, Robert, Esq. Paymaster H. M. 9th Regiment, Subathoo.
 Bogle, Major Archibald, (2nd Regiment N. I.) Commissioner of
 Arracan, Akyab.
 Boldero, John Stephen, Esq. Civil service, Agra.
 Bowring,† Samuel, Esq. Civil service.
 Boyd,† W. S. Esq. Merchant.
 Boyle, E., Esq. Merchant, Calcutta.
 Bracken, William, Esq. Civil service, Calcutta.
 Bracken, Thomas, Esq. Secretary Bank of Bengal, Calcutta.
 Braddon,† William Clode, Esq. Merchant.
 Bradley, W. H. Esq. Medical service, Ellichpore.
 Brae, Thomas, Esq. Indigo planter, Calcutta.
 Brandreth, E. L. Esq. Civil service, Ajmere.
 Brodie,* Lieutenant T. (10th Regiment N. I.) Principal Assistant
 to the Commissioner of Assam.
 Brooke, Lieutenant John C. (63rd Regiment N. I.) Adjutant, Meywar
 Bheel Corps.
 •
 Brown, Forbes Scott, Esq. Merchant, Penang.

Brown, W. D. Esq. Merchant, Akyab.
 Brown,† J. C. Esq. Civil service, (Cape of Good Hope.)
 Brownlow, Henry, Esq. Civil service, Cuttack.
 Bruce, Lieutenant H. LeG. Artillery, Meerut.
 Bruce, C. C. Esq. Merchant, Calcutta.
 Buckle, Captain E. Assistant Adjutant General, Artillery, Dum-Dum.
 Buckland, R. H. Esq. Merchant, Calcutta.
 Buckland, C. T. Esq. Civil service, Chittagong.
 Buller,* Frederick Pole, Esq. Civil service, Shajehanpore.
 Brunet, P. Esq. Indigo planter, Nohutta factory, Jessore.
 Burnett, Lieutenant F. C., Artillery, Dum-Dum.
 Burt,† Benjamin, Esq. M.D. Bengal Medical service.
 Bushby, George Alexander, Esq. Civil service, Calcutta.
 Butcher, Charles, Esq. Indigo planter, Dacca.
 Byrne, Wale, Esq. Head Assistant, Judicial and Revenue Departments of Government, Calcutta.

Calleychunder Lahoree, Baboo, Dewan to the Rajah of Cooch-Behar.
 Cameron, The Honorable C. H. Esq. Member of the Supreme Council, Calcutta.
 Campbell, W. F. Esq. Merchant, Calcutta.
 Campbell,† Donald, Esq. Merchant.
 Campbell, Colin, Esq. Merchant, Calcutta.
 Campbell,* Archibald, Esq. M.D. Medical service, Superintendent of Darjeeling.
 Campbell, Lieut. Robert, (47th Regiment N. I.) Gowhatty, Assam.
 Cardew,† Cornelius, Esq. Civil service.
 Carmichael,† Lieut.-Colonel C., Military service.
 Carpenter, Major T. D. Governor-General's Agent, &c. Benares.
 Carr, The Honorable —, Puisne Justice, Ceylon.
 Carter, J. W. Esq. Merchant, Calcutta.
 Carter, P. P. Esq. Indigo planter, Bhojepore factory, near Buxar.
 Cathcart, John Fergusson, Esq. Civil service, Tirhoot.
 Caulfield,† Major-General James, C. B.
 Cautley,†† Captain P. T. Bengal Artillery.
 Cazenueve, J. P. Esq. Indigo planter, Tirhoot.
 Chapman, Charles, Esq. Civil service, Chuppra.
 Chapman,† Henry, Esq. Merchant.
 Charles, Rev. James, D.D. Senior Minister, St. Andrew's Church, Calcutta.
 Cheap, George Charles, Esq. Civil service, Bauleah.
 Cheape, Colonel John, C. B. Chief Engineer, Fort William.
 Cheek, George Nicholas, Esq. Medical service, Bancoorah.
 Cheek, A. H. Esq. Medical service, Sullutpore, viâ Jansy.
 Clapperton, Captain A. B. Assistant Master Attendant, Calcutta.
 Clarke, Longueville, Esq. F.R.S. Barrister, Supreme Court.
 Close, Lieutenant Edward, (32nd Regiment N. I.) Jubbulpore.
 Clunes, A. G. Esq. Indigo planter, Jessore.

Collins, B. S. Esq. Military Board office, Calcutta.
 Colvin,† Colonel John, C.B. Bengal Engineers, (Honorary Member.)
 Colvin, B. J. Esq. Civil service, Calcutta.
 Colvin,† Alexander, Esq. Merchant.
 Colvin, John Russell, Esq. Civil service.
 Congreve, C. Esq. Merchant, Calcutta.
 Connyeloll Tagore, Baboo, Merchant, Calcutta.
 Cooper, Captain G. L. (Artillery) Ajmere.
 Cooper, J. H. Esq. Tutor to the Nawaub of Moorshedabad, Berhampore.
 Corbett, Major Stuart, (25th Regiment N. I.) Kyouk Phyou.
 Corbyn, Frederick, Esq. Medical service, Simla.
 Cossinauth Dutt, Baboo, Merchant, Calcutta.
 Cotton, Captain Henry, (67th N. I.) Deputy Judge Advocate General, Saugor Division.
 Coull,† Archibald D. Esq. Indigo planter.
 Courjon, F. Esq. Indigo planter, Chandernagore.
 Cowell, James, Esq. Merchant, Calcutta.
 Cowie,* Henry, Esq. Merchant, Calcutta.
 Cowie, David, Esq. Merchant, Calcutta.
 Cowie, John, Esq. Merchant, Calcutta.
 Cox, Lieut.-Colonel Henry, C.M. (58th Regiment N. I.) Jubbulpore.
 Cox, J. H. W. Esq. Indigo planter, Surdah.
 Cracroft,† William, Esq. Civil service.
 Cragg, J. W. Esq. Merchant, Calcutta.
 Crawford,† Stephen Rowan, Esq. Merchant.
 Crooke, James, Esq. Merchant, Calcutta.
 Crooke, Arthur, Esq. Indigo planter, Tirhoot.
 Currie,† Edward, Esq. Civil service, (Cape of Good Hope.)
 Currie, J. A. Esq. Merchant, Calcutta.
 Curtis,† James, Esq. Civil service.

 Dampier, William, Esq. Civil service.
 Dearie,† Charles, Esq., Merchant.
 Dearman, George, Esq. Merchant, Calcutta.
 DeCourcy, Richard, Esq. Indigo planter, Chandernagore.
 Debendernauth Tagore, Baboo, Merchant, Calcutta.
 Denham, J. G. Esq. Medical service, Gyah.
 Dent,† William, Esq. Civil service.
 Dickson,† John Burnie, Esq. Medical service.
 Dirom, William Maxwell, Esq. Civil service, Chuppra.
 Dixon,* Major Charles G. (Artillery,) Superintendent of Ajmere and Mairwarra.
 Dodd, Richard, Esq. Merchant, Calcutta.
 Dombal, Lewis Durup de, Esq. Indigo planter, Jessore.
 Donald, John, Esq. Indigo planter, Belsee, via Budaon.
 Donaldson,† John William, Esq. Indigo planter.
 Donnelly, Alexander Frederick, Esq. Civil service, Malda.

- Donnithorne,† James, Esq. Civil service.
 Doolan,† Lieutenant Robert Cope.
 Dorin, Joseph Alexander, Esq. Civil service, Calcutta.
 Dougal,† John, Esq. Merchant.
 Downes, Ezra Thomas, Esq. Bengal Medical service, Bombay.
 Downing, W. P. Esq. Attorney, Supreme Court, Calcutta.
 D'Oyly,† J. H. Esq. Civil service.
 Drummond,† Captain Henry, (3rd Regiment Light Cavalry.)
 Drummond,† John, Esq. Medical service.
 Drummond,† The Honorable Edmond, Civil service.
 Dubus, E. G. Esq. Indigo planter, Nohutta factory, Jessore.
 Duff, The Rev. Alexander, D.D. Missionary Free Church of Scotland, Calcutta.
 Duncan, James, Esq. Medical service, Chittagong.
 Dunlop, Allan Campbell, Esq. Indigo planter, Rungpore.
 Dunlop,† Alan Colquhoun, Esq. Indigo planter.
 Dunlop, Allan Campbell, Esq. Indigo planter, Jessore.
 Dwarkanauth Tagore,† Baboo, Merchant.

 Earle, Willis, Esq. Merchant, Calcutta.
 Edgeworth,† Michael Pakenham, Esq. Civil service.
 Edmonstone, George Edward, Esq. Civil service, Bolundshahur.
 Edwardes, Captain George H. (13th Regiment N. I.) Executive Officer, Keerpoy.
 Egerton, Charles C. Esq. Medical service, Calcutta.
 Eld, Lieutenant Lionel P. (9th Regiment N. I.) Assistant to the Commissioner of Arracan, Akyab.
 Elias,* Owen John, Esq. Merchant, Calcutta.
 Elliot,† John, Esq. Merchant.
 Elliot, W. Henry, Esq. Civil service.
 Eliot, Lieutenant John, (Artillery,) Dum-Dum.
 Elwall, Captain Frederick C. (49th N. I.) Thuggee Department, Chuppra.
 Ewer,† Walter, Esq. Civil service.
 Eyre, Lieutenant Vincent, (Artillery,) Gwalior.

 Falconer,† H. Esq. M.D. and A.M. Medical service.
 Fenning, Captain S. W. (Bengal Artillery,) Neemuch.
 Fergusson, William Fairlie, Esq. Merchant, Calcutta.
 Fergusson,† James, Esq. Merchant.
 Finch, Jeffrey, Esq. Indigo planter, Shahpore Oondee, Tirhoot.
 Finch, Simon, Esq. Indigo planter, Goruckpore.
 Forbes, Lieut.-Colonel W. N. (Bengal Engineers,) Mint Master, Calcutta.
 Fraser,† W. T. Esq. Merchant.
 Fraser,† Charles, Esq. Civil service.
 Fraser, Alexander, Esq. Civil service, Goorgaon.
 Freeman,† A. Esq. Indigo planter.

French, John Gilmore, Esq. Deputy Magistrate, Dacca.
 French, Henry G. Esq. Indigo planter, Surdah.
 French, Gilson R. Esq. Indigo planter, Surdah.
 Frith, Brigadier W. H. L. (Commandant of Artillery,) Dum-Dum.
 Frith, R. W. G. Esq. Calcutta.
 Furlong, James, Esq. Indigo planter, Kishnagur.

 Garrett, Robert Birch, Esq. Civil service, Cuttack.
 Garstin,† Charles, Esq. Civil service.
 Garstin, Lieut.-Colonel Edward, (Engineers,) Superintending Engineer for the Lower Provinces.
 Gerard, Captain John Grant, (European Regiment,) Kussowlie.
 Gibbon,† W. F. Esq.
 Gilmore, M. S. Esq. Civil service, Cuttack.
 Gillanders, George, Esq. Merchant, Calcutta.
 Gilmore,† Allan, Esq. Merchant.
 Gilmore, Captain John, (Bengal Engineers,) Executive Officer, Ghazee pore.
 Gladstone, Murray, Esq. Merchant, Calcutta.
 Gladstone,† Adam S. Esq. Merchant.
 Glass, G. D. Esq. Indigo planter, Dacca.
 Glass, A. G. Esq. Merchant, Calcutta.
 Gooroodoss Dutt, Baboo, Merchant, Calcutta.
 Gordon, Charles Alexander, Esq.
 Gordon, G. R. Esq. Moulmein.
 Gouger,† A. Esq. Merchant.
 Gouldsbury, F. Esq. Civil service, Bhangulpore.
 Goureyersaud Roy Chowdry, Baboo, Landholder, Rungpore.
 Grant, The Honorable Sir John Peter, Puisne Judge, Supreme Court, Calcutta, (President.)
 Grant, William Patrick, Esq. Master in Equity and Accountant General, Supreme Court, Calcutta.
 Grant, John Peter, Esq. Civil service.
 Grant, Archibald, Esq. Attorney, Supreme Court, Calcutta.
 Grant,† Charles, Esq. Civil service.
 Grant, James, Esq. Civil service, Dinagepore.
 Grant,† John, Esq. Medical service.
 Gregg, J. A. Esq. Indigo planter, Dumdum Factory, viâ Patolee.
 Greig, Alexander, Esq. Medical service, Seetapore.
 Griffiths,† E. P. Esq. Merchant.
 Griffiths, S. P. Esq. Merchant, Calcutta.
 Grote,*† Arthur, Esq. Civil service.
 Gubbins, Charles, Esq. Civil service, Paneeput.
 Gubbins, F. B. Esq. Civil service, Rohtuck.
 Gubbins, M. R. Esq. Civil service, Furrackabad.
 Gubbins, J. P. Esq. Civil service, Delhi.
 Guise, Captain Henry J. (28th Regiment N. I.) Dorundah.
 Gungadbur Seal, Baboo, Merchant, Calcutta.

- Halfhide,† Major Benjamin, (H. M. 44th Regiment.)
 Halkett,† Henry Craigie, Esq. Civil service.
 Hall, Capt. Arthur, (5th Light Cavalry.) Stud Department, Tirhoot.
 Hamilton, Robert North Collie, Esq. Civil service, Resident at Indore.
 Hamilton, John, Esq. Merchant, Calcutta.
 Hammill, William, Esq. Merchant, Calcutta.
 Hampton, F. R. Esq. Agent Agra Bank, Calcutta.
 Hannay, Captain Simon Fraser, (40th Regiment. N. I.) Commanding Assam Light Infantry, Jeypore.
 Hannynghton, Captain John C. (24th N. I.) Deputy Commissioner, Chota Nagpore.
 Hansen, The Honorable P.
 Harding,† Benjamin, Esq. Merchant.
 Harding,† Edward, Esq. Merchant.
 Harris, A. G. Esq. Pilot service, Calcutta.
 Harrison, R. P. Esq. Civil service, Midnapore.
 Hathorn, H. V. Esq. Civil service, Chuppra.
 Haworth,†† William, Esq. Merchant, Calcutta.
 Hawkins,*† John Abraham Francis, Esq. Civil service, (Cape of Good Hope.)
 Heatly, S. G. T. Esq. Calcutta.
 Hedger, W. N. Esq. Attorney, Calcutta.
 Hemnauth Roy, Baboo, Merchant, Calcutta.
 Henderson,† Henry B. Esq. Merchant.
 Henley, T. F. Esq. Merchant, Calcutta.
 Herklots, John Dederick, Esq. Indigo planter, Berhampore.
 Hervey, Colonel Andrew, (30th Regiment N. I.) Lucknow.
 Hewett, K. H. Esq. Chuppra.
 Higginson, J. B. Esq. Merchant, Mirzapore.
 Hills,* James, Esq. Senior, Indigo planter, Kishnagur.
 Hills,† James, Esq. Junior, Indigo planter.
 Hill, J. M. Esq. Indigo planter, Tirhoot.
 Hill, George, Esq. Secretary Medical Retiring Fund, Calcutta.
 Hill,† James, Esq. Merchant.
 Hodgson, Brian Haughton, Esq.
 Hodgson, Brian, Esq. Civil service, Simlah.
 Hogge, Lieutenant Charles, (Artillery.)
 Hollings, Charles, Esq. Sub-Deputy Opium Agent, Gya.
 Hollings, Captain G. E. (38th N. I.) Assistant to the Resident at Lucknow.
 Holroyd,† Thomas, Esq. Merchant.
 Honeywood,† Major Edward John.
 Hudson, Nathaniel, Esq. Attorney, Supreme Court, Calcutta.
 Hufnagle, Charles, Esq. Merchant, Calcutta, (Honorary Member.)
 Hugon, Thomas, Esq. Assistant to the Superintendent of Salt Works.
 Hulodhur Bhose, Baboo, Merchant, Calcutta.
 Hume, James, Esq. Barrister, Supreme Court, Calcutta, (Honorary Secretary.)

Hunter, C. M. Esq. Indigo planter, Jessore.
 Hurreynarain Dey, Baboo, Merchant, Calcutta.
 Hurrey Mohun Sen, Baboo, Dewan of the Bank of Bengal, Calcutta.
 Huthwaite, Major Edward, Commanding Artillery, Meywat Field Force, Neemuch.

Impey, Lieutenant E. J. Assistant to Commissioner of Tenasserim Provinces, Moulmein.
 Inglis, Henry, Esq. Sylhet.

Jackson, Welby Brown, Esq. Civil service, Calcutta.
 Jackson, C. C. Esq. Civil service, Agra.
 Jackson,† Alexander R. Esq. M. D.
 James, Lieutenant H. C. (32nd Regiment N. I.) Jubbulpore.
 Jenkins, Major Francis, Commissioner in Assam, and Governor General's Agent on the N. E. Frontier.
 Jenkins, E. Esq. Civil service, Gyah.
 Jenkins, John, Esq. Merchant, Calcutta.
 Jennings, C. R. Esq. Indigo planter, Surdah.
 Johnson,† George William, Esq. Barrister.
 Johnson, J. Esq. Indigo planter, Furreedpore.
 Jones, J. B. Esq.
 Jourdain,† The Honorable Mr.
 Judge, Spencer, Esq. Attorney, Supreme Court, Calcutta.

Kaye,† J. William, Esq.
 Kearnes, Duppa Hamilton, Esq. Indigo planter, Hazrapore factory, viâ Jenida.
 Kelsall,† T. S. Esq. Merchant.
 Kemp, Henry Chapman, Esq. Merchant, Calcutta!
 Kettlewell, W. W. Esq. Merchant, Calcutta.
 Kirk, K. W. Esq. Medical service, Bundelkund Le[†]ton, Jhansee.
 Kirke, Captain H. (12th Regiment N. I.) Supt. of the Dhoon Canal, Deyrah.
 Kirkpatrick, W. Esq. Deputy Register, Sudder Dewanny Adawlut, Calcutta.
 Kissub Chunder Roy, Baboo, Landholder, Nuddeah.
 Knott, John, Esq. Deputy Collector, Backergunge.

Laidlay, J. W. Esq. Merchant, Calcutta.
 Lake,† W. H. Esq. Merchant.
 Lake,† R. B. Esq. Merchant.
 Lamb, George, Esq. Medical service, Dacca.
 Lang, A. Esq. Civil service, Allahabad.
 Larpent, Albert De Hochipied, Esq. Merchant, Calcutta
 Laruletta,* A. Esq. Indigo planter.
 Latter, Captain Thomas, (67th Regiment N. I.) Arracan.
 Lattey,† R. J. Esq. Merchant.

- Lawrence, Major H. M. (Artillery,) Resident at the Court of Nepaul.
 Lazarus, B. W. Esq. Merchant, Calcutta.
 Leach,*† Thomas, Esq. Merchant.
 Leishman, R. Esq. Merchant, Calcutta.
 Leith, J. F. Esq. Barrister, Supreme Court, Calcutta.
 Lewis, W. T. Esq. Assistant Resident, Penang.
 Leycester,† G. P. Esq. Civil service.
 Liebig,† Dr. Justus, Germany, (Honorary Member.)
 Lindsay,† Alexander Kyd, Esq. Medical service.
 Llewelyn, J. G. Esq. Calcutta.
 Lloyd, Colonel G. W. A. (17th Regiment N. I.) Sylhet.
 Loch, T. C. Esq. Civil service, Beerbhoom.
 Logan,† W. R. Esq. Indigo planter.
 Loughnan, Robert James, Esq. Civil service, Backergunge.
 Lovell, George, Esq. Merchant, Penang.
 Lowis, John, Esq. Civil service, Calcutta.
 Lowth, Frederick, Esq. Civil service, Beerbhoom.
 Lowther,* Robert, Esq. Civil service, Allahabad.
 Ludwig,† Baron, Cape of Good Hope, (Honorary Member.)
 Luke, William, Esq. Civil service, Arrah.
 Lushington, Frederick A. Esq. Civil service, Pubna.
 Lyall,† Charles, Esq. Merchant.
 Lyall,† Robert, Esq. Merchant.
 Lyall, John, Esq. Merchant, Calcutta.
 Lyons, Lieutenant Edward, Superintendent of Cachar.
- McArthur, Peter, Esq. Indigo planter, Malda.
 McClintock,† George Frederick, Esq. Civil service, (Cape of Good Hope.)
 McCullum, D. Esq. Merchant, Calcutta.
 McDonell, E. Esq. Sub-Deputy Opium Agent, Chumparun, Tirhoot.
 McDougall, William, Esq. Indigo planter, Sulkeah factory, Bogra.
 McDowall, William, Esq. Indigo planter, Rungpore.
 MacFarlan,† David, Esq. Civil service.
 Macfarquhar, Major H. Tavoy.
 MacDonald,† Peter, Esq. Indigo planter.
 Mackenzie, James, J. Esq. Merchant, Calcutta.
 Mackilligin, J. P. Esq. Merchant, Calcutta.
 Mackintosh,† George G. Esq. Civil service.
 Mackay,† G. Esq. (Honorary Member.)
 Mackey, D. C. Esq. Merchant, Calcutta.
 MacLagan,* Frederick, Esq. Indigo planter, Kishnaghur.
 Macleod, Charles, Esq. Calcutta.
 McLeod,† Colonel Duncan, (Engineers.)
 McLeod, Donald Frieid, Esq. Civil service, Benares.
 McLeod, Major William, Assistant to the Commissioner of the Tenasserim Provinces, Moulmein.
 McLeod, Donald, Esq. Deputy Magistrate, Tirhoot.

- MacMullen, Lieutenant A. L. (23rd N. I.) Dinapore.
 Macnair, Robert, Esq. Indigo planter, Joradah factory, Jessore.
 Macpherson,* George G. Esq. Merchant, Calcutta.
 Macpherson, H. Esq. Medical service, Gwalior.
 Maddock, The Honorable Sir T. H., Deputy Governor of Bengal, Calcutta.
 Maharaj,* Dheraj Matabchund, Bahadoor, Rajah of Burdwan.
 Manickjee,* Rustomjee, Esq. Merchant, Calcutta.
 Mansell,† Charles Grenville, Esq. Civil service.
 Marcus,* J. P. Esq. Calcutta.
 Marquis, J. Esq. Indigo planter, Pubna.
 Marshman, J. C. Esq. Editor of the Friend of India, Serampore.
 Massey,† George, Esq. Merchant, (China.)
 Masters,* J. W. Esq. Upper Assam.
 Mathie,* Major James, (European Regiment,) Deputy Commissioner of Assam.
 May,† John Stuart, Esq.
 May, George, Esq. Merchant, Calcutta.
 Melville,† The Honorable W. H. L.
 Metcalfe, H. C. Esq. Civil service, Bhaugleapore.
 Millman,† G. C. Esq. Merchant, London.
 Mills,* Andrew John Moffat, Esq. Civil service, Cuttack.
 Molloy, R. Esq. Attorney, Calcutta.
 Money,* William James Henry, Esq. Civil service, Berhampore.
 Money, Wigram, Esq. Civil service, Mirzapore.
 Money, David Inglis, Esq. Civil service, Kishnaghur.
 Moore,† Major J. A.
 Moore, Henry, Esq. Civil service, Calcutta.
 Moran, William, Esq. Indigo planter, Tirhoot.
 Mornay, H. Esq. Deputy Secretary Assam Company, Calcutta.
 Morton, T. C. Esq. Barrister, Supreme Court, Calcutta.
 Mouat, Frederick J. Esq. M.D., Secretary to the Council of Education, and Professor of Chemistry, &c. Medical College, Calcutta.
 Munceram Burbundaree Burrooah, Gowhatty, Assam.
 Munro, Captain William, F. L. S. and F. B. E. S. (H. M. 39th Regiment.)
 Murray, Charles, Esq. Indigo planter, Serajung factory, Pubna.
 Mutteelall Seal,* Baboo, Merchant, Calcutta.
 Mylius,† Captain George, (26th Cameronians.)
- Napleton, Major T. E. A. (60th Regiment N. I.) Commandant of Hill Rangers, Bhaugleapore.
 Neave, Robert, Esq. Civil service.
 Newcomen,† C. E. Esq. Merchant.
 Nicol, Frederick, Esq. Indigo planter, Jessore.
 Nisbet,† Captain E. P. Commander of the *Agincourt*, (Free Member.)
 Nobinchunder Bhose, Baboo, Merchant, Calcutta.
 Nundololl Sing, Baboo, Merchant, Calcutta.

Nursinghunder Roy, Rajah, Calcutta.
Nursinghunder Bhose, Baboo, Merchant, Calcutta.

Oboychurn Banoorjee, Baboo, Merchant, Calcutta.
Ogilvy, J. B. Esq. Civil service, Cuttack.
Olpherts, Lieutenant H. A. Artillery, Meerut.
Ommaney, M. C. Esq. Civil service, Mirzapore.
O'Riley, Edward, Esq. Agriculturist, Amherst.
Ouseley, Lieut.-Colonel J. R., G. G.'s A., S. W. Frontier, and Commissioner of Chota Nagpore.
Ouseley, Captain R. (50th Regt. N. I.) Principal Assistant G. G.'s A., S. W. Frontier.

Palmer, Lieut.-Colonel Thomas, (72nd N. I.) Delhi.
Palmer, R. S. Esq. Merchant, Calcutta.
Palmer, John Carrington, Esq. Merchant, Calcutta.
Palmer,* Thomas, Esq. Merchant, Calcutta.
Parker,† Alfred, Esq. Merchant.
Parker,† Henry Meredith, Esq.
Parsons, Lieut.-Colonel James, (50th Regiment N. I.) Deputy Commissary General, Cawnpore.
Paton, Francis Balfour, Esq. Merchant, Calcutta.
Patrick, William, Esq. Merchant, Calcutta.
Payter,* J. W. Esq. Indigo planter, Bogorah.
Peel, The Honorable Sir Lawrence, Chief Justice, Supreme Court, Calcutta, (Vice-President.)
Phayre, Captain A. P. Senior Assistant to the Commissioner of Arracan, Akyab.
Pickard, Edward, Esq. Bareilly.
Piddington, Henry, Esq. Sub-Secretary Asiatic Society, Calcutta.
Playfair,† George, Esq. Medical service.
Potter, Owen, Esq. Merchant, Calcutta.
Price, J. O. Esq. Government Cotton planter, Dacca.
Prinsep, Charles Robert, Esq. L. L. D., Standing Counsel, Supreme Court, Calcutta.
Proby, F. Esq. Merchant, Dacca.
Prosonoo Coomar Tagore, Baboo, Calcutta.

Quintin, William St. Quintin, Esq. Civil service, Gyah.

Radhakant Deb, Bahadoor, Rajah, Calcutta, (Vice-President.)
Radhamadhub Banoorjee, Baboo, Merchant, Calcutta.
Raikes, Henry Thomas, Esq. Civil service, Midnapore.
Rainey, W. H. S. Esq. Indigo planter, Kholna, Jessore.
Rajkissen,* Mookerjee, Baboo, Landholder, Hooghly.
Rajbullub Seal, Baboo, Merchant, Calcutta.
Rajmohun Roy, Chowdry, Baboo, Landholder, Rungpore.
Randhand Sing, Rajah, Berhampore.

- Ramgopaul Ghose, Baboo, Merchant, Calcutta, (Vice-President.)
 Ramdhone Ghose, Baboo, Deputy Collector 24-Pergunnahs, Calcutta.
 Ramnanath Tagore, Baboo, Dewan of the Union Bank, Calcutta.
 Rattray, Robert Haldane, Esq. Civil service, Calcutta.
 Ravenshaw, E. C. Esq. Civil service, Patna.
 Rayson, P. Esq. Indigo planter, Cossipore factory, viâ Patoolee.
 Reddie, Captain G. B. (29th N. I.) Sub-Assistant Commissary General, Neemuch.
 Rehling, W. Esq. Indigo planter, Rungpore.
 Reid,† J. Esq. Civil service, (Australia.)
 Remfry, George, Esq. Merchant, Calcutta.
 Rennie, John, Esq. Merchant, Calcutta.
 Reynolds, Lieutenant C. S. (49th N. I.) Junr. Assistant Commissioner of Assam.
 Rich,†† Colonel R. (60th Regiment N. I.) Loodianah.
 Richardson,† Robert, Esq. Civil service.
 Richards,*† J. Esq. Merchant.
 Richards, C. J. Esq. Merchant, Calcutta.
 Ridsdale, William Croft, Esq. Superintendent Bishop's College Press, Calcutta.
 Rigny, Lieutenant H. Engineers, Cuttack.
 Robinson,* Francis Horsley, Esq. Civil service, Agra.
 Robinson, Captain Edward Innes, (7th Light Cavalry.) Superintendent of the Bhuttee Territory, Sirsa.
 Robinson, S. H. Esq. Indigo planter, Culna.
 Robinson, G. B. Esq. Merchant, Calcutta.
 Robison, Charles Knowles, Esq. Police Magistrate, Calcutta, (Vice President.)
 Rogers, Captain T. E., I. N. Master Attendant, Calcutta.
 Rolfe, W. A. Esq. Medical service, Cachar.
 Rose, William Grant, Esq. Merchant, Calcutta.
 Ross,† A. Esq. Civil service.
 Rowe, Gilson, Esq. Indigo planter, Jessore.
 Royle,† John Forbes, Esq. M.D., F.R.S., F.L.S., F.G.S., Professor of Materia Medica, King's College, London, (Honorary Member.)
 Rustomjee Cowasjee, Esq. Merchant, Calcutta.
 Russell, C. D. Esq. Civil service, Bauglepore.
 Russell, Francis Whitworth, Esq. Civil service, Hooghly.
 Ryan, E. B. Esq. Taxing Officer, Supreme Court, Calcutta.
 Ryan,† Right Honorable Sir Edward, A. M. (Honorary Member.)
 Ryder, Edward Lisle, Esq. Merchant, Calcutta.
- Sage, R. P. Esq. Indigo planter, Boriburee factory, Rungpore.
 Sage, Major Wm. (48th N. I.) Supg. Engineer, N. E. Provinces.
 Sagra,† Don Ramas De La, (Honorary Member,) Island of Cuba.
 Samuells,* Edward A. Esq. Civil service, East Burdwan.
 Sarkies, P. J. Esq. Merchant, Calcutta.
 Saunders, J. O. B. Esq. Indigo planter, Allyghur.

- Savi, John Robert, Esq. Indigo planter, Sindoorree, Jessore.
 Sawers,† A. Esq. Merchant, Calcutta.
 Scott,† George, Esq. Merchant.
 Scott, Lieutenant Charles, Principal Assistant to the Commissioner of Assam, (27th Regiment N. I.) Tezpor, Assam.
 Scott, Keith Macalister, Esq. Medical service, Gowhatti, Assam.
 Sconce, Archibald, Esq. Civil service, Backergunge.
 Sealy, Cudbert Thornhill, Esq. Civil service, Sylhet.
 Seppings,† John M. Esq.
 Seton, The Honorable Sir Henry Wilmot, A.M. Puisne Judge, Supreme Court, Calcutta.
 Sharpe, The Reverend James, Chaplain, Benares.
 Shaw,† Thomas, Ambrose, Esq. Civil service.
 Shaw,† W. A. Esq. Indigo planter.
 Shaw, James Campbell, Esq. Indigo planter, Baleeah factory, viâ Buxar.
 Shawe, M. Esq. Civil service, Backergunge.
 Showers, Captain St. Geo. D. Superintendent of the Education of the Nawaub Nazim of Bengal, Berhampore.
 Sinclair, George Esq. Sugar planter, Malliat factory, viâ Commercolly.
 Skipwith, F. Esq. Civil service, Tipperah.
 Sleeman, Lieut.-Colonel William Henry, (1st Regiment N. I.) Agent to Governor General, Saugor and Nerbudda Territories.
 Small, James, Esq. Merchant, Calcutta.
 Smith, Samuel, Esq. Proprietor of the Hurkaru Newspaper, Calcutta.
 Smith, A. T. Esq. Deputy Collector, and Superintendent of the Sydpor Trust Estate, Jessore.
 Smith, George Henry, Esq. Civil service, Delhi.
 Smith,† Francis Curwen, Esq. Civil service.
 Smith, Robert, Esq. Merchant, Calcutta.
 Smith, Adam Freer, Esq. Merchant, Calcutta.
 Smith, Sydney George, Esq. Civil service, Bijnore.
 Speede, G. T. Frederick, Esq. Calcutta, (Free Member.)
 Speirs, Lieut.-Colonel Alexander, (44th N. I.) Resident at Nagpor.
 Spier,† William, Esq. Merchant.
 Spiers, Captain William, Merchant, Rangoon.
 Sreekissen Sing, Baboo, Calcutta.
 Sreekissen Mullick, Baboo, Calcutta.
 Stacy, Colonel Lewis Robert, C. B. (43d Regiment N. I.) Commanding at Futtehghur.
 Stainforth,† F. Esq. Civil service.
 Stalkart, William, Esq. Merchant, Calcutta.
 Staunton, M. S. Esq. Assistant Military Auditor General's Office, Calcutta.
 Steel, Major James, (2nd European Regiment,) Agra.
 Steer, Charles, Esq. Civil service, Dinagapore.
 Stephenson, R. M. Esq.
 Stevenson,*† William, Esq. Junior, M. D. Medical service.

Stewart,* Captain William M. (22nd Regiment N. I.) Fort Adjutant, Chunar.

Stewart,† Robert, Esq. Merchant.

St. Pourçain, J. Esq. Indigo planter, Chandernagore.

Storm, William, Esq. Merchant, Calcutta.

Storm, John, Esq. Merchant, Calcutta.

Stopford,† James Sydney, Esq. Merchant.

Stokes, Lieutenant S. W. Artillery, Secrole, Benares.

Stowell, C. S. Esq. Merchant, Calcutta.

Strickland, R. S. Esq. Merchant, Calcutta.

Strong, F. P. Esq. Medical service, Calcutta.

Sturgis,† Henry P. Esq. American Consul, Manilla.

Sturt, R. R. Esq. Civil service, Backergunge.

Sutherland,† Colonel J.

Sutherland, Patrick, Esq. Assistant Military Board Office, Calcutta.

Sutherland, Charles, J. Esq. Merchant, Moulmein.

Suttoo Churn Ghosaul, Rajah, Calcutta.

Syme,† Andrew, Esq. Merchant.

Swatman, Captain William, (65th N. I.) Assistant Commissary General, Dacca.

Swinhoe, T. B. Esq. Attorney, Calcutta.

Talib Ally Khan, Zemindar, Gyah.

Taylor, C. B. Esq. Palamow.

Taylor, George, Esq. Barrister at Law, Calcutta.

Thomason, The Honorable James, Lieutenant Governor of the N. W. Provinces, Agra.

Thomson,† R. Scott, Esq. Surgeon.

Thompson, J. V. Esq. M. D., F. L. S. Deputy Inspector General of Hospitals, Sydney.

Thomson, R. M. M. Esq. M. D. Medical service, Calcutta.

Thornton, John, Esq. Civil service, Agra.

Thurburn, R. V. Esq. Indigo planter, Kishnaghur.

Tickell, Captain S. R. (31st N. I.) Assistant Commissioner, Chota Nagpore.

Tiemroth,† C. Esq.

Tiery, L. Esq. Indigo planter, Berhampore.

Todd,† James, Esq.

Tonnochy, Thomas, Esq. Deputy Collector, Bolundshohur.

Torrens, Robert, Esq. Civil service, Calcutta.

Tremblehansen, W. C. Esq. Indigo planter, Shahabad.

Trevor, Edward Tayler, Esq. Civil service, Cuttack.

Trotter,† John, Esq. Civil service.

Trotter, T. C. Esq. Civil service, Tirhoot.

Tucker, Charles, Esq. Civil service, Calcutta.

Tucker, Henry Carre, Esq. Civil service, Goruckpore.

Tulloh, C. R. Esq. Civil service, Futtehpore.

Turner,* Thomas Jacob, Esq. Civil service, Allahabad.

Turner, George, Esq. Medical service, Mirzapore.
 Turton, ~~Sir~~ Thomas E. M. Bart. Barrister, Supreme Court.
 Tweedie,† John, Esq. Indigo planter.
 Twemlow, Major George, Nizam's Army, Ellichpore.

Vansittart, H. Esq. Civil service, Deyra Dhoon.
 Vetch, Capt. Hamilton, Political Assistant, Debroghur, Upper Assam

Waghorn,† Thomas, Esq. (Honorary Member.)

Wallace, A. Esq. Merchant, Calcutta.

Wallich, N. Esq. M.D., F.R.S., F.L.S., F.G.S., Superintendent of
 the H. C. Botanic Garden, Calcutta.

Walters,*† Henry, Esq. Civil service.

Warner,† Edward Lee, Esq. Civil service.

Watson,† Major General Sir James, K.C.B.

Watson,† John, Esq. Indigo planter.

Watson,* Robert, Esq. Indigo planter, Calcutta.

Watt, Robert, Esq. Indigo planter, Tipperah.

Watts, H. O. Esq. Collector of Assessment, Calcutta.

Wagh, Captain A. S. Surveyor General of India, Allahabad.

Wemyss, Captain James, (44th Regiment N. I.) Lucknow.

Wight,* Robert, Esq. M.D. Madras Medical service, Superintendent
 Government Cotton plantations, Coimbatore.

Williams, Fleetwood, Esq. Civil service, Budaon.

Williams, Lieutenant W. H. (67th N. I.) Sylhet.

Willis, Joseph, Esq. Merchant, Calcutta.

Wise, J. P. Esq. Indigo planter, Dacca.

Wise, Thomas, Esq. Medical service.

Woodcock, T. Parry, Esq. Civil service, Allahabad.

Woodcock,† E. E. Esq. Civil service.

Woodcock, Lieutenant S. C. Artillery, Cawnpore.

Wood, George, Esq. Calcutta.

Wollaston,† Henry A. Esq. Merchant.

Wray, L. Esq. Penang.

Wyatt, Thomas, Esq. Civil service, Rungpore.

Wylie, Macleod, Esq. Barrister, Supreme Court, Calcutta.

Young,* Thomas, Esq. Civil service, Backergunge.

Young, G. J. Esq. Indigo planter, Pubna.

Yule, J. W. Esq. Indigo planter, Tirhoot.

